RAILROAD GAZETTE

FRIDAY, APRIL 29, 1898.

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Contributions.

De Pontibus.

Terre Haute, Ind., April 4, 1898.

To the Editor of The Railroad Gazette.

Will you permit me to say a few words in your columns concerning the unique book De Pontibus, which has recently appeared?

From my experience as a teacher of bridge designing it seems to me that the book can be very advantageously used in technical schools, both as a reference book in the classes and as a nucleus for lectures by the teacher.

There are several excellent publications which contain an abundance of theory of the determination of stresses and the general principles of designing, but not one of them contains a systematic statement of the various steps required to produce a structure well designed in all its parts. The necessary matter is contained in these books, but presented in such shape that the teacher must constantly remind the student that the reason for this or that is given on page —, etc. The explanation for this is easily given, for in the classroom the theoretical points must necessarily be taken up before the practical modifications are considered; these are best appreciated if they immediately follow the theoretical discussions. . . .

For several years I have compelled my students to make all calculations in note books and I am very glad to have a book containing a chapter which can be used as a lever in convincing them that the requirement is not a whim on my part. . . .

I question somewhat the author's belief that the book will be useful, first, to practicing bridge engineers; second, to young engineers in offices of bridge specialists, etc.; third, to professors of civil engineering, and fourth, to students in civil engineering. If the order had been reversed I believe the statement would have been more nearly true.

Practicing bridge engineers usually have specifications and methods based upon their own practice and ideas. Young engineers in charge of offices of specialists must necessarily follow the directions of their superiors. Hence it seems to me that in the ranks of these two classes De Pontibus will first appear as a missionary advocating the creed of the author. . . .

In the technical school, however, all methods in general use must be taught, and, as De Pontibus is the only book which contains a complete discussion of the practical side of bridge designing . . . it becomes an excellent guide for the teacher, as well as his students. The teacher can point out wherein other engineers differ with the author and introduce his own ideas without detracting from the usefulness of the book. . . .

MALVERD A. HOWE,
Prof. Civil Engineering,
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Mr. Acworth on American Railroads.*

Financial Position.

Among a large number of English people there is the strongest objection to any American railway investment. On the other hand, there are many Englishmen who have every reason to be satisfied with their experience of American investments. The United States is a wide country, a country of extremes, not only climatic, but financial, and among its 180,000 miles of railway are to be found some of the best and some of the worst investments in the world. My own firm conviction is that the best American railway securities are positively the finest investments in existence. I can more easily imagine Consols of North-Western debentures going without their interest than I can conceive the bonds of, say, the Lake Shore or the United Railroads of New Jersey in default. On the other hand, out of the two thousand million pounds which represent the capitalization of American railways, I would write off at once fully three-quarters; in other words, the whole of the ordinary stock and half the bonds, as entirely unsuitable for the ordinary English investor.

Not but what there are many American lines which pay good and steady dividends on their ordinary stock. Nor is it easy to believe that these great undertakings will do worse in the future than in the past. But of this no ordinary investor in this country can be absolutely sure. American trade fluctuates so widely, American railways work on such fine margins, and the personal element is in American railway management of such vital importance that a very few years would suffice to cross the gulf between a large and legitimate dividend and a receivership. The richest company in England, the London and North-Western, earned in 1896 a gross income of about £12,000,000, of which fully one-fourth went in dividends to the ordinary shares, in the same period an even richer company, the New York and New Haven, earned about £6,000,000. The ordinary shareholders got 8 per cent., against the North-Western 7⅛; but their dividend only absorbed £750,000, or one-eighth of the gross revenue. The remaining seven-eighths were intercepted before reaching them, for (if we ignore the comparison of interest on debt and taxes which have to be paid in both countries), the American line spent nearly 68 per cent. of its earnings in working expenses, as against 55 per cent. here, while another 12 per cent. went in rental of leased lines, an item which cuts no figure at all in the North-Western accounts.

Evidently both in England and America the whole loss due either to increased expenditure or to diminished earnings must fall upon the dividends of the ordinary shares, and it needs no argument to show that a loss of gross income amounting to one-eighth would sweep away the whole of the New Haven dividend, while it would only halve that of our own North-Western. In these circumstances American railway shares must be regarded as investments only suitable for those who can keep constant watch over a constantly changing situation. But given the opportunity to do this, I am far from implying that American shares are less safe investments than our own.

Our great English companies scrupulously charge against revenue everything that can reasonably be regarded as revenue expenditure, and where there is any question always give the capital account the benefit of the doubt. They even go further and replace a small locomotive or carriage by a larger one and light rails by heavier ones at the cost of revenue; but there they stop. To put it broadly, no English railway ever purchases additional rolling stock or doubles a single line out of revenue, while all the first-class American roads do this as a matter of course. In fact, it may be said that, while a first-class English company, after providing for working expenses and fixed charges, distributes among its shareholders the entire surplus, however large, a first-class American company never divides its profits up to the hilt. Rather is the dividend treated as a quasi-fixed charge. It is placed at a point which the management considers the undertaking capable of reaching, even under the most unfavorable conditions, and all surplus beyond it, however large, is devoted to "betterments" and reserve. A prosperous year only results in a larger surplus of revenue being applied to capital purposes. In other words, the shareholders of a first-class line are year by year largely improving out of their own pockets the bondholders' security. The bonds, however, stand in an altogether different position. If the railway passes its dividends the bondholder will hardly be unaware of the fact, and, as things would have to go much worse before his claims would fail to be met, he will then have time to inquire and act accordingly. Even a receivership need have no terrors for a bondholder possessing an undoubted first charge on the railway property. An English debenture-holder has no right except to receive the income, where there is any. An American bondholder can take possession of the corpus of the property, can sell the site of the terminus, if he thinks fit, in building plots—a right whose value is, perhaps, as a rule, somewhat visionary—or can, which is more important, foreclose all security holders junior to himself, and so can in practice force them to pay his claims in full out of their own pockets rather than allow him to wipe out their rights altogether. And yet such is the mistrust in England of all American investments that railway bonds, whose security is practically absolute, can be bought to-day to yield a return at the rate of 3¼ to 3½ per cent.

Such is in outline, as it appears to me, the position of American railways as investments to-day. It remains to touch very briefly on the prospects before them in the future. The general, and as far as I can judge the correct, opinion in America is that their position is not likely to get worse, but will rather improve.

There was a time, not so many years ago, when the most serious risk to railway property was from violently hostile, sometimes practically confiscatory, State legislation. That time has almost passed. State Legislatures have learned by experience that violent attacks on railway property recoil ere long on the general prosperity of the whole State. One railway president, whose line traverses 13 States, told me that rate regulation by Act of Legislature had ceased to trouble him. The point at which courts of justice will interpose to protect railway property against unconstitutional exaction is coming to be fairly well known, and recent decisions of the Supreme Court have done not a little to relax the trammels which the Federal Act to Regulate Commerce and the Interstate Commerce Commission had attempted to impose. State pressure is at present felt more in the form of heavy and rapidly increasing taxation.

A more serious obstacle to railway prosperity is to be found in the constant reduction in railway rates effected by the companies themselves. These reductions are in the main due to two causes—the first a desire to stimulate traffic which can only be got at very low rates, and the second, competition. On the first head it may be said that the reductions are probably not on the whole unprofitable. One-fifth of a penny per ton per mile for long-distance coal or export grain will yield, even allowing for the return of the cars empty, the handsome revenue of 10s. per train mile, provided you haul, as Chesapeake and Ohio engines can over Chesapeake and Ohio gradients, gross loads of not less than 2,000 tons. Further, as the country fills up, local traffic at comparatively high rates bears an ever-increasing ratio to through traffic at minimum rates; in other words, the average ton-mile earning is quite as likely to go up—as has actually been the case in New England—as to go down.

As for competitive rate reductions it is difficult to know what to think. I had the opportunity of discussing the subject with not a few of the highest authorities in the United States—railway presidents, officers of the different traffic associations, and representatives of the Federal Government at Washington. The opinions given me were diametrically opposed to one another. Hardly had I been assured in New York that rate-cutting was a thing of the past, that Congress was on the point of legalizing pooling, and that everybody would live happily and harmoniously ever afterwards, when I was told at Washington that rate-cutting was worse than ever, that no Congress dare legalize pooling, and that a representative who voted for it would inevitably lose his seat. In Chicago the same contradiction awaited me. My own distinct impression, the result of these entirely conflicting opinions, is that the same thing is happening in the railway world of America as has happened in the political world of Europe. A state of war was habitual, peace a rare exception. But as armies have increased in size and national resources augmented, war has become so serious that the most reckless statesman dare not engage in it with a light heart. So in America the great railway corporations which are rapidly absorbing their petty neighbors are learning to dread a trial of strength with their equally great rivals; the public has discovered that rate wars mean secret reductions to the richest and least scrupulous among the customers of the railways; and before long it seems likely that if rate wars cannot be stopped by any less drastic process railway officials will reluctantly make up their minds publicly to denounce, and so to hand over to the fine and imprisonment prescribed by the Act to Regulate Commerce any freight agent who dares to agree to carry traffic at rates other than those published in the authorized tariffs.

Lastly, I must mention, as among the serious questions confronting the railways in the thickly settled part of the country north of the Ohio River and east of the Missouri—what is known in America as the "grade crossing" question. Englishmen may be surprised to learn that in the State of New York alone there are 15,000 level crossings over public roads, 9,000 of which have not even a gate to protect them; that the main line of the Pennsylvania is in many parts unfenced; that the "Empire State Express" runs like a tramcar down the middle of the high street of Syracuse, a town of 100,000 inhabitants; and that in Buffalo, with half a million inhabitants, the passenger station of the Delaware, Lackawanna and Western is literally a corner shop at the foot of the principal street. As population increases, and the speed and frequency of trains increase simultaneously, this position of affairs is becoming intolerable. Two things are, however, in their favor. They have long acted on the conservative policy of charging, in the words of a recent report of the Atchison Company, "expenditures on betterment . . . to operating expenses, except in cases where such expenditures will tend to permanently increase net earnings." And, further, public opinion recognizes that it is not just that the railways should bear this great expense unaided. The effect of this is not only to lighten the railway burden, but—which is, perhaps, even more important in practice—to restrain popularity hunting politicians from pressing the execution of necessary improvements with inconvenient speed.

To sum up in a sentence—American railways from the technical point of view are improving with great rapidity; from the financial point of view they have reached, at least in the northeastern section of the country, a comparatively stable and prosperous position; from both points of view they deserve closer study on the part of Englishmen than they have hitherto received.

*Extracts from the fourth of a series of articles in The Times.

The Chilled Cast-Iron Wheel.

By R. P. C. Sanderson.

In the discussion which followed the reading of that paragraph of a paper on "Fads, Customs and Their Cost," having reference to the relative cost of chilled cast iron wheels and steel tired wheels, some very emphatic opinions were expressed before the New York Railroad Club by those who preferred to use and do use steel tired wheels under passenger cars. It is believed that the present time is opportune for presenting a full discussion of this question, with special reference to the use of chilled cast-iron wheels under passenger equipment cars. The writer has had a considerable experience with the manufacture and use of chilled wheels, but has had little to do with steel tired wheels under passenger cars, and this article is put forward in the hope of bringing out the gentlemen on the other side with facts and figures—not mere assertions or opinions based on prejudice—in support of the steel tired wheel.

It may be well to first refer to the statement with which a couple of the speakers qualified their condemnation of the chilled wheel—namely that one could not depend on getting good wheels. This is begging the question. The Master Car Builders publish specifications for chilled iron wheels, prepared and revised by a committee of experts, which they recommend. There are plenty of firms who will furnish wheels that will more than pass these specifications for a reasonable price; which, according to locality will be from one-fifth to one-eighth the cost of a first-class steel tired wheel of the same diameter. To get these is simply a matter of management. To claim that there is risk of other wheels of inferior make getting under the passenger cars by mistake is also begging the question, for the special

wheels for passenger service can be marked with some large letter, figure or badge for easy identification. To plead that they cannot do these things is foreign to the issue, and purely a matter of management; the discussion should be limited to a first-class M. C. B. wheel, and the shoddy article bought at a price below the cost of good iron should be left out of the case.

The two main arguments used in favor of the steel tired wheel by its advocates are safety and smooth running. Let us consider the latter first.

Smoothness of running is governed by accuracy of workmanship and balance. The requirements of the M. C. B. specifications as regards variations in diameters will insure wheels that when carefully chucked and bored will not require much grinding to obtain perfect concentricity.

If the advocates of steel tired wheels can calmly contemplate the heavy lathes needed for turning down steel tires, is there any reason why they should object to considering the use of grinding machines to grind up chilled wheels to a true circle to obtain equal smoothness of running at high speeds in passenger service? The average cost to grind a pair of new 33-in. wheels, cast from contracting chills, mounted on the axle, at a shop making a regular practice of this for passenger service, is:

For labor	18 cents
For emery wheel loss	3 cents
Average cost, per pair	21 cents
For regrinding second hand wheels—slid flat or shelled:	
For labor	22 cents
For emery wheel loss	6 cents
Average cost, per pair	28 cents

And the writer can testify to the fact that these passenger trains ride as smoothly as any trains on steel tired wheels. It is not believed that steel tired 33-in. wheels can be re-turned for less than $1.30 per pair average cost, including tool steel and dressing. Even if these figures are a few cents out either way it still leaves a long balance in favor of the chilled iron wheels, which only cost 28 cents per pair (day labor, not piecework) to grind perfectly true.

From the results obtained by the New York Car Wheel Works, and by others, it can be safely asserted that equally well balanced wheels can be turned out of chilled iron as with steel tires, at the same or less cost for balancing, and it is plain that extreme care or perfection in balancing is not of great importance. Before the out-of-balance of a wheel can produce any vibration in the car body over it, it must be so great that the upward impulse is over say 850 lbs. (representing the weight of the wheel itself and half the weight of the axle), when there would be a tendency for the wheel to lift off the rail if not held down by the weight on the journal. Only under these conditions can a badly balanced wheel produce any vibration in the car, so that only wheels that are considerably out of balance after grinding really require balancing.

Before going into the question of safety it will pay us to touch on two other very important considerations.

Assuming that there are about 34,000 passenger equipment cars in constant service and that the number of wheels under these cars (four and six-wheeled trucks) will approximate 306,000; that a first-class 33-in. chilled wheel weighs 600 lbs., and that a first-class 33-in. steel tired wheel will average 802 lbs.—some of them weigh over 1,000 lbs. each—this will mean that the difference in weight of this many wheels alone, as between cast iron and steel tired wheels, would be 30,900 tons, which if hauled around the country under passenger trains will require coal to do it and help to wear out the track.

As regards cost, unless the prices of steel tired wheels have changed recently it may be stated for the purpose of comparison that a really first-class, 33-in., steel tired wheel cannot be bought much under $50 each; but to be as liberal toward the steel wheel as possible, let us take the cost of a 33-in. steel tired wheel at $40. It is well understood that in many favored localities a strictly first-class 600-lb. chilled wheel to stand the M. C. B. specifications can be made for $5 each.

A pair of chilled wheels, 33 in.	$10.00	
Cost of grinding true	21	
Cost of a pair of 33 in. chilled wheels, not including the axle and cost of mounting		$10.21
A pair of steel tired wheels, 33 in.	$80.00	
Difference in favor of the chilled wheels per pair		$69.79
Or for a car having eight wheels, per car		279.16
For a car having twelve wheels, per car		418.74

Recently published reports of wheel performance records by Mr. J. N. Barr for the Milwaukee road, and Mr. Griffin, for the New York Car Wheel Co., show that the possible average mileage for chilled wheels is going to be pretty close to 200,000 miles if the manufacturers go on improving their products as they have been doing recently. But we have referred to the M. C. B. specifications and for further comparison as to cost per mile let us take the M. C. B. guarantee for chilled wheels, which is now for 8-wheel passenger cars 60,000 miles. A reputable firm of steel wheel makers guarantee their wheels (costing about $50 each new) for 260,000 miles, and the wheels will average 3½ turnings to make this mileage. Therefore, we have:

First cost of a pair of steel-tired wheels	$80.00
Cost of 3½ turnings, including shop handling	5.25
Cost of 3½ removals and replacements at 60c	2.10
	$87.35
Credit by scrap, 1,108 lbs. at $8 and $10 per ton	4.94
Cost per pair for steel tired wheels to run 260,000 miles	$82.41

leaving the interest account, which would be compounding itself steadily during the time, out of consideration. On the basis of the M. C. B. guarantees we would require four and one third pairs of chilled wheels to run the same 260,000 miles. So we have:

Cost of four and one-third pairs of chilled wheels ground	$13.91
Cost of four and one-third replacements at 60c	2.60
Cost of four and one-third shop handlings	87
Cost of four and one-third strippings, borings and remountings	1.17
	$48.55
Value of scrap, say, 3,020 lbs., at $10 per ton	22.41
Net cost for chilled wheels to run 260,000 miles per pair	$26.14
Difference in favor of chilled wheels per pair at the end of 260,000 miles	$56.27

It has been stated in reply to this that such figures are not fair, because at the end of that time we still have the steel tired wheel centers and can put on a new pair of tires and get practically a new pair of wheels for the cost of the new tires and fitting. But a new pair of 33-in. tires 2½ in. thick will cost about $42.50 at present prices, while the new chilled wheels will be $10 for the pair, and the boring out and refitting of the tires will cost much more than the stripping, boring and regrinding of the chilled wheels. Also it must be remembered that some of the steel tired wheels cannot be re-tired at all, but must be scrapped when the steel rim is worn out or ruined in any way. Also some candid persons who ought to know have stated that, with certain makes of steel tired wheels, when the wheel has worn out its second tire and sometimes before this, the parts of the wheel centers become loosened and worn, as well as brittle or crystallized, to such an extent that the wheel must be scrapped anyhow.

There is yet another and very important item of cost to be considered, and that is rail wear. It is not necessary to say very much to any thinking mechanic to convince him that the rail wear and train resistance (affecting also the tonnage rating and coal consumption as well as the speed) will be greater where steel tired wheels are used than with chilled wheels, not so much on account of the rolling friction of the treads, but on account of the grinding of the flanges against the sides of the railheads. Hard cast iron will run fairly well on soft steel, but soft steel on soft steel is a combination that will invariably result in heating and cutting. Any one wishing to get an idea of the importance of this may profitably study the results, as regards heating and friction obtained by the M. C. B. committee in the laboratory tests of cast iron and soft steel shoes on steel tires.

Coming now to the all important question of safety. About twenty months ago a careful search by the writer through the records of accidents as published in the railroad papers furnished some information on this head which was published then and was not contradicted, so it will bear repetition now, it being a matter of regret that the files for 1896-7 are not accessible for search so that the information can be brought up to date.

These records show that there were just 22 cases of wrecks or derailments reported in 1895 for the whole of the United States and Canada, freight and passenger, caused by broken wheels, while there must have been something like 9,720,000 chilled wheels in service under both freight and passenger cars during the year. Wheels are sometimes broken in a derailment and the investigators, for want of some better cause, blame the wheel, where closer and more painstaking investigation by some one other than the roadmaster, who is an interested party, would show that the fault lay in the track. Reference to such records for 1896 as are accessible indicates that not a single passenger was hurt or killed during the year on a steam railroad from a broken wheel wreck, although quite 90 per cent. of the passenger equipment cars ran on cast wheels and the passengers carried must have been close to 600,000,000. The following is believed to be a fairly correct estimate of the number of accidents caused by broken wheels in 1886 to 1895, inclusive:

1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
37	27	48	28	37	39	46	48	33	22

In Mr. Griffin's paper read before the American Society of Mechanical Engineers some statistics as to steel tire failures in the German Empire are given. These have also never been gainsaid as far as the writer has been able to ascertain, and therefore may be quoted here:

Year.	1884.	1885.	1886.	1887.	1888.	1889.
Number of steel tires in use	941,945	959,682	992,636	1,007,966	1,041,135	1,102,941
Number broken.	2,853	3,549	3,988	2,964	3,874	3,380
Per cent. broken	0.30	0.37	0.40	0.29	0.37	0.31

Of course this does not mean that each of these broken tires caused an accident or wreck, although doubtless many of them did so. They are quoted to show that steel tires will break, and quite often, too. No mention is made of the failure of the wheel centers of the steel tired wheels, which either caused accidents or simply were removed before the danger point was reached or were removed to repair defects and afterward used again. If such information were forthcoming it would have to be compared with similar figures for chilled wheels removed for cracks found by inspection in the hubs and plates or brackets; the great majority of chilled wheels are removed for defects of the treads, not for cracks in the plates or hubs.

No one thing has done more to advance the knowledge of wheel irons than the thermal tests. This thermal test is par excellence a test for safety and it will be interesting to dwell a little on the results obtained to show that rapid progress toward certainty in the knowledge of wheel irons is being achieved. The first report of a thermal test for car wheels which the writer has been able to find reference to was made by Mr. Griffin in 1891; he then poured a half-inch band of melted iron around the wheel treads. The next well-known tests of this kind were made by Mr. Small of the Southern Pacific at his Sacramento shops in 1891, the reports of which were published in the M. C. B. proceedings for 1892, which report is very well worth careful study. It brings out prominently the importance of the form of the wheel and shows how wheels made from the same iron will vary in strength to resist cracking from brake heating according to the shape of the plates, brackets, etc. The next public reports of interest concerning thermal tests of chilled wheels were made in 1896, giving the results of thermal tests made by the Pennsylvania at Altoona, which resulted in the adoption of a certain thermal test for chilled wheels by that company, which is now also to be found in the Recommended Practices of the Master Car Builders' Association. This thermal test has opened up a new line of inquiry and with the assistance of their chemists some of the railroad companies who make their own wheels are accumulating accurate information from chemical analysis, tests under the drop and on the testing machine, thermal tests and wear records, and so are learning a great deal about cause and effect not known before.

In the report of the committee of the M. C. B. Association on specifications and guarantee for cast-iron wheels, of which Mr. J. N. Barr was chairman, five conditions are mentioned which go to increase the strength of wheel irons to resist heat cracking. Among these is mentioned the addition of ferro-manganese. To show what the effect of ferro-manganese (whether added separately or originally in the pig iron) is upon the wheel mixture the following may be of interest: Using a certain mixture of wheel irons the wheels produced would average from 12 to 15 15 blows of the M. C. B. drop test before breaking in pieces, the iron showed on a 2 in. x 2 in. test bar ⅞-in. chill, with a transverse strength unchilled of 44,000 lbs. per square inch average and a deflection of $\frac{139}{1000}$-in. average for thousands of wheels. These wheels, however, cracked through the treads in from 40 seconds to 1½ minutes under the M. C. B. thermal tests.

The addition of a small amount of ferro manganese costing less than 5 cents a wheel, while still leaving the chill ⅝-in. deep on the tread, increased the average number of blows of the drop test that the wheels would stand to 35, the strength increased to 54,000 lbs. per square inch, sometimes reaching 60,000 lbs. per square inch, with a deflection of $\frac{230}{1000}$ (on 23-in. length) and these wheels will stand the thermal test for 4 minutes and some of them don't break through the rim at all.

The above items are cited simply to show those railroad officers not familiar with what is being done in the way of improvements in the manufacture of chilled wheels that marked progress is being made. It is to be hoped that those who decry the chilled wheels and say they would not use them under passenger cars and do not consider them safe for high speeds will now come forward and give their facts and figures to support their position. It will certainly not be sufficient to say that they remember a wreck caused by a broken chilled wheel resulting seriously. We must know by indisputable evidence that this was not a shoddy wheel that had no business there anyhow. Boilers burst now and then, yet we certainly could not refuse to use all boilers and depend on electricity for the motive power of our passenger trains to avoid a possible boiler explosion. We rather endeavor to improve the design and materials of the boilers and give them more watchful care. Even so with the chilled-iron wheel—a peculiarly American product—of which we may well feel proud, which can and certainly will be improved to meet modern requirements of weight, speed and safety by improved methods of manufacture. Already the published records of cast-iron wheel mileages show that they may before long come pretty near giving us a mileage almost equal to a 2½-in. tire on a steel wheel.

A Pittsburgh Ten-Wheeler for the Wabash.

The engraving shows a 10-wheel freight engine built for the Wabash Railroad from the designs of Mr. J. B. Barnes, Superintendent of Motive Power. It is one of an order for five placed with the Pittsburgh Locomotive & Car Works. These engines are in use and Mr. Barnes reports that they are giving entire satisfaction. The principal dimensions follow:

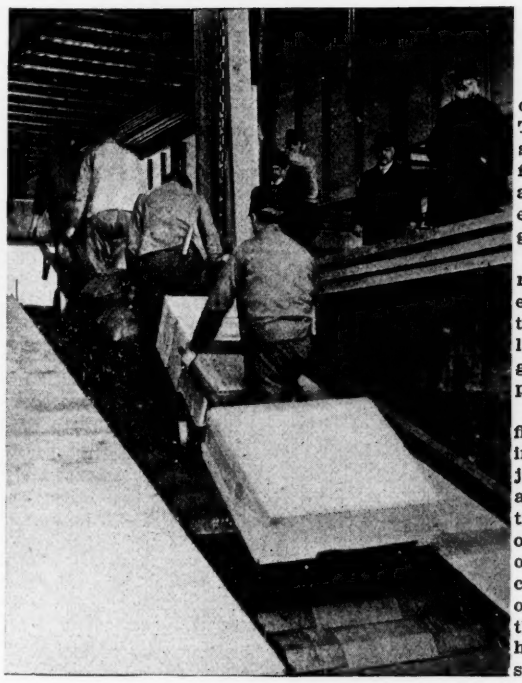
Wabash Railroad—Ten-Wheel Freight Locomotive.

Fuel	Bituminous coal
Gage of track	4 ft. 8½ in.
Weight of engine in working order	137,000 lbs.
" " " on drivers	108,000 lbs.
Driving wheel base of engine	14 ft. 0 in.
Total " " " "	24 ft. 5¾ in.
" " " " and tender	49 ft. 3½ in.
Height from rail to top of stack	14 ft. 7 in.
Cylinders, diameter and stroke	19 x 26 in.
Slide valve	Richardson balance
Piston rods	Steel, 3½ in. diam.
Type of boiler	Extended wagon top
Diameter of boiler at smallest ring	62¼ in.
" " " " back head	73¼ in.
Crown sheet supported by radial stays	1 in. diam.
Stay bolts, 1 in. diameter, spaced 4 in. from center to center.	
Number of tubes	300
Length of tubes over tube sheet	14 ft. 5 in.
" of firebox, inside	101½ in.
Width of " "	42¼ in.
Brick arch	Yes
Working pressure	200 lbs.
Kind of grates, R. R. Co.'s standard	Cast iron
Grate surface	29.92 sq. ft.
Heating surface in tubes	2,223.27 sq. ft.
" " in firebox	186.16 sq. ft.
Total heating surface	2,409.43 sq. ft.
Diameter of driving wheels outside of tires	63 in.
" and length of journals	8 x 10 in.
" of truck wheels	30 in.
" and length of journals	5 x 9 in.
Type of brakes	Westinghouse American
Type of tank	Level top, Wabash R. R. standard
Water capacity	4,500 gals.
Fuel "	10 tons
Weight of tender with fuel and water	90,000 lbs.

Freight Ramps.

The freight ramp or traveling gangway is of great value in reducing the cost and time of loading and unloading vessels. Essentially the machine is an endless conveyor between the water end of the wharf and the inboard end, and, its direction of travel being reversible, it will carry freight from the warehouse to the vessel or vice versa. To meet the varying conditions of high and low water and vessels whose ports come at different points above and below the level of the pier, the ramp is pivoted at its inboard end, so that the outer end may be swung to meet the port of the vessel to be loaded or unloaded.

The illustration is a ramp installed by the Metropolitan Steamship Co., at the India Wharf, Boston. It consists of a hinged platform, which is made up of a moving portion and a stationary gangway. The apron of the moving part is composed of continuous metal covered planks, fastened to two strands of chain. This apron travels around the head and foot



A "Freight Ramp" on a Wharf.

wheels of the ramp on flanged wheels running on T-rail tracks. In going to or from the vessel with their loaded trucks, the men pass over a metal plate resting on the vessel's deck and on arms projecting from the sides of the moving section of the ramp. These arms are of such construction that the plate may be adjusted to form an unbroken path from the vessel to the ramp, whatever the angle at which the latter is running. The trucks and their loads, therefore, are not jarred in being taken to or from the vessel. The plate arrangement at the inboard end is somewhat different from that at the vessel end, but it also is designed to prevent shocks and insure the men and their loaded trucks against accident as they go upon or leave the traveling platform.

The ramp is counterweighted at its lower end, and may be swung into any desired position by operating, by hand, a chain working in connection with worm gearing, which raises or lowers the counterweights. The ramp is locked in position by the worm gearing.

The wheels of the trucks rest in the recesses formed by the planks of the moving apron, and the men are relieved of the weight of the loads. They return with their unloaded trucks on the stationary part of the gangway.

The machine illustrated is driven by a 7½ H. P. motor, is about 20 ft. long, is run at a speed of 105 ft. per minute, and may be swung to any angle between 18 degrees below or 18 degrees above the level of the wharf. A month's use of it demonstrated that the number of men required was reduced, as was the time. Thus there is a saving of labor cost, and also of the time of the ship. The Metropolitan Co., therefore, immediately installed three more of these ramps, and the Northern Steamship Co. of Buffalo has put in six similar to those at the India Wharf.

The Link-Belt Engineering Co. of Philadelphia and New York were the builders in each case. Their Western house, the Link-Belt Machinery Co. of Chicago, some time since equipped the Algiers Dock (New Orleans), of the Southern Pacific Co., with a number of these machines. At this dock they are in pairs, the two sections running in opposite directions—one for loading and the other for unloading.

Railroad Legislation in Iowa.

The Iowa Legislature, recently adjourned, passed only three laws relating generally to transportation. The first is an act authorizing the Railroad Commissioners to extend the time for the equipment of freight cars with automatic couplers to Jan. 1, 1900; and the second is an act increasing the taxation of express companies. The rate is made 2 per cent. on gross receipts instead of 1 per cent.

The most important act of the session was the one relating to the liability of railroads for injuries to employees. This bill is better known in the State as the Temple amendment. It has been agitated in the last two sessions of the Legislature, and makes illegal a clause in the contracts of railroad relief departments. It reads as follows:

"Nor shall any contract of insurance, relief, benefit or indemnity in case of injury or death, entered into prior to the injury, between the person so injured and such corporation or any other person or association acting for such corporation, nor shall the acceptance of any such insurance, relief, benefit or indemnity by the person injured, his widow, heirs or legal representatives after the injury from such corporation, person or association constitute any bar or any defense to any cause of action brought under the provisions of this section; but nothing contained herein shall be construed to prevent or invalidate any settlement for damages between the parties subsequent to injuries received."

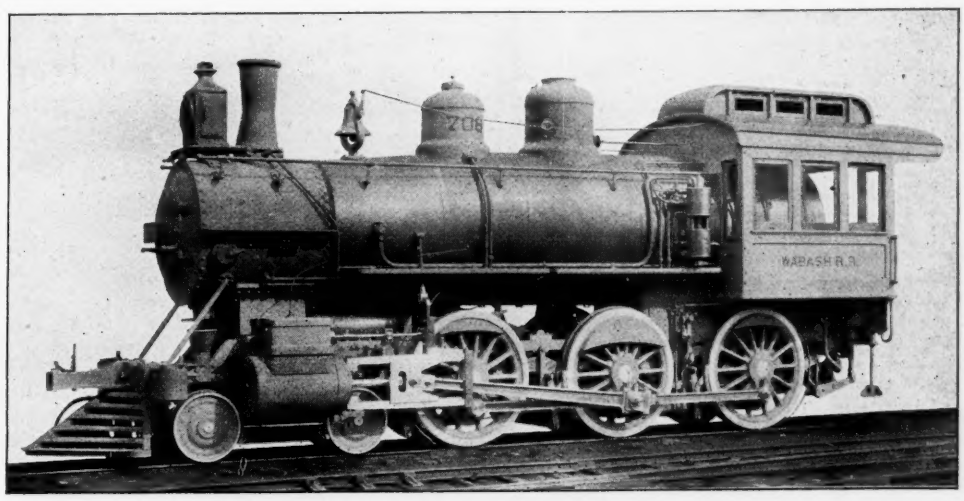
A two-cent fare bill was killed in committee.

An Experiment in High Voltage Transmission.

An experiment in high-voltage, long-distance, electric power transmission was lately made at Ogden, Utah, by Mr. F. O. Blackwell, of the General Electric Company, over the lines which connect the power station at Ogden with the distributing circuits at Salt Lake City. This experiment consisted in connecting the Salt Lake ends of the transmission lines together and dividing the transformers at Ogden, nominally used for raising the pressure of the current for transmission, into step-up for the outgoing current and step-down for the incoming. The distance from the power station at Ogden to Salt Lake City is about 36.5 miles. A complete circuit of the outgoing and incoming lines gave a complete transmission circuit of 73 miles over three No. 1 wires. The power transmitted amounted to 1,000 H. P., and the voltage at which the transmission was effected reached at times as high as 30,000 volts. The current on the return was delivered to resistance vats at the power house, consisting of three wooden tanks.

Mr. Blackwell ascertained that the power was transmitted with the loss of only 9 per cent., including 4 per cent. loss in the two sets of transformers.

Continuing the experiment, part of the Salt Lake City station load was run from Ogden, with current at 24,000 volts. This was supplied to about 500 H. P. in synchronous motors and lights for two days, under severe climatic conditions, rain, fog and snow alternating. In addition, a severe thunderstorm prevailed through the night, the lightning arresters discharging repeatedly. Notwithstanding the severity of the conditions under which the test was made, the motors worked without failure and the lights burned without flickering even during the times of lightning discharges. Not the slightest difficulty of any kind developed while this experiment lasted.



Pittsburgh Ten-Wheel Freight Locomotive for the Wabash.

By a recent consolidation all the electrical plants in Salt Lake City, as well as the transmission plants, supplying current to the outside, have been merged into the Union Light & Power Co. The companies thus consolidated were the Pioneer Electric Power Co., the Salt Lake & Ogden Gas & Electric Co., the Big Cottonwood Power Co., the Little Cottonwood Power Co., the Citizens' Electric Light Co., and certain smaller interests.

The plant of the Pioneer Electric Power Co. is an important installation, with long-distance transmission. The power house is a short distance from the mouth of the Ogden Canyon. The power is derived from the Ogden River, the water being brought to the power house through a wooden stave pipe and riveted steel pipe line about 32,000 ft. long, which, with the power plant, we have described in the past.

Premiums to Freight Conductors and Station Agents.

The Cincinnati, New Orleans & Texas Pacific, for the half year ending Dec. 31 last, paid premiums of $40 each to 11 freight conductors, and for the nine months ending on the same day premiums were paid to 20 station agents and 14 telegraph operators. The agents received $15 each, except in cases where they were not telegraph operators, in which case they received $10; and men who were only operators received $5 each. Two agents received each $15 additional for showing the largest percentage of increase in sales of tickets, collections on extra baggage, etc., and the total amount of all these premiums was $820.

The plan on which these premiums were offered and paid was described in the Railroad Gazette of Feb. 5, 1897. Freight conductors make their record on six features of their work: (1) cars moved; (2) making schedule time; (3) promptness and accuracy in reports; (4) cleanliness; (5) economical use of supplies; (6) good judgment in emergencies. The conductor moving the largest number of cars in a month is credited with 300 "merits," and the other conductors receive credits in a reasonable proportion to this. A perfect record is indicated by 10 merits in each feature for each day. A conductor running his train through in not less than two hours greater than the time allowed is marked 10 in that column. For exercising good judgment in emergencies merits may be awarded from 10 to 600. For breaches of rules or accidents demerits are imposed, and the total of these is deducted from the merits before the average is taken. If a conductor is held responsible for an accident resulting in $50 damage he would receive 50 demerits; $100 damage, 100 demerits. The average is obtained by dividing the net total of merits by the total number of trains.

In the accompanying table we show the first four items in a summary for six months of the conductors' record on that part of the road of which Mr. W. J. Murphy is Superintendent. The sixth merit column

is one which, in the nature of the case, must usually remain blank. The 75 merits here shown are the only ones that we find in that column on the whole list. The premium was paid to all conductors whose average was above 45. It appears to be the intention of the Superintendent to give the reward to each man showing 90 per cent. of perfection. The fact that the first man on this list shows an average of more than 100 (103.2) is due to the arbitrary allowance of 300 per month for moving cars; this is on the assumption that the conductor runs 30 trips, whereas, in fact, he usually runs a less number. In this case the number for six months was 151, or an average of only 25 a month.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC RAILWAY CO.

Average Performance of Freight Conductors, Six Months Ending Dec. 31, 1897.

	Merits.						Demerits.					
	Made schedule time.	Cars moved.	Promptness and accuracy in reports.	Cleanliness.	Economical use of supplies.	Good judgment in emergencies.	Breach of rules.	Accidents.	Total merits.	Total demerits.	Total trains.	Average.
Lanigan, John	1,510	1,766	1,508	1,485	1,510	....	....	....	7,779	....	151	51.51
Collins, J. T	1,150	1,023	1,148	1,052	1,150	75	....	....	5,596	....	115	48.66
Davis, F. S	950	876	946	845	950	....	....	....	4,562	....	95	48 02
Hutchison, Thos	1,340	1,280	1,300	1,125	1,340	....	....	....	6,385	....	134	47.65

Premiums are paid to yard conductors on the basis of promptness and accuracy in reports and economical use of supplies, and to yard enginemen on cleanliness and economical use of supplies. Road enginemen and firemen receive fuel premiums.

The merits of agents and operators are based on neatness and cleanliness of station buildings and contents, accuracy in accounts, reports and records; promptness in answering correspondence, forwarding reports and remittances, answering telegraph calls, reporting trains, transmission of telegrams; economy in the use of supplies and strict observance of the rules. Premiums are paid to all who average 90 per cent.

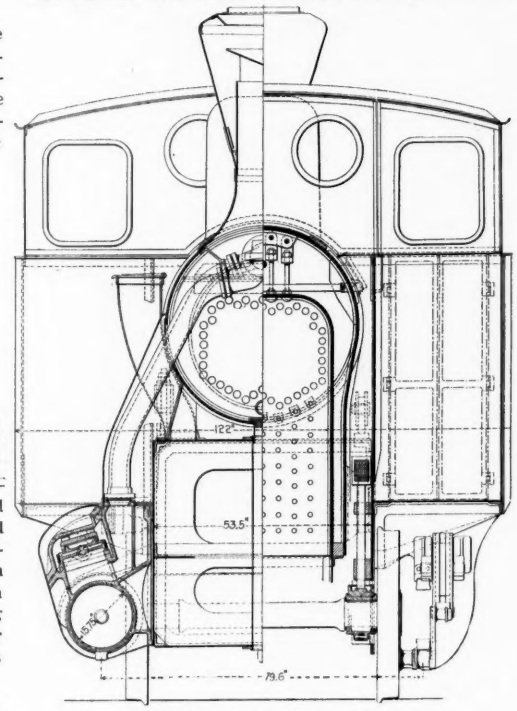
Receiver Felton informs us that the premiums have resulted in marked improvement among all the classes to which they are offered, and he seems to be highly satisfied with this expenditure of $820. There has been a noticeable improvement in the efficiency of the men in every one of the items on which the merit marks are based. The recognition by the company of success in making schedule time leads conductors to be more careful in watching for defects in cars or running gear, instead of waiting until these are brought to notice by an accident or delay. The conductors have the co-operation of the enginemen in hauling as many cars as possible, as the coal premiums are based on the consumption of coal per 100 tons of freight handled. For the eight months of the current fiscal year the average trainload has been 389 tons, as compared with 331 tons for the preceding year.

Six-Coupled Tank Engine for the Trans-Manchurian Railroad.

We illustrate herewith a six-coupled tank engine for the construction of the Trans-Manchurian Railroad, which, it will be recollected, is being built ostensibly by a private company, but in reality by the Russian Government, from a point on the Great Siberian Railroad across Chinese territory to the naval port of Vladivostok. This line will now be carried to Port Arthur, the Russian Government having succeeded in extorting a "lease" of the latter place from the Chinese. Twelve of these engines have been built at the Hanover Locomotive and Engineering Works (successors to George Egestorff) at Hanover and shipped to Vladivostok. The chief dimensions are as follows:

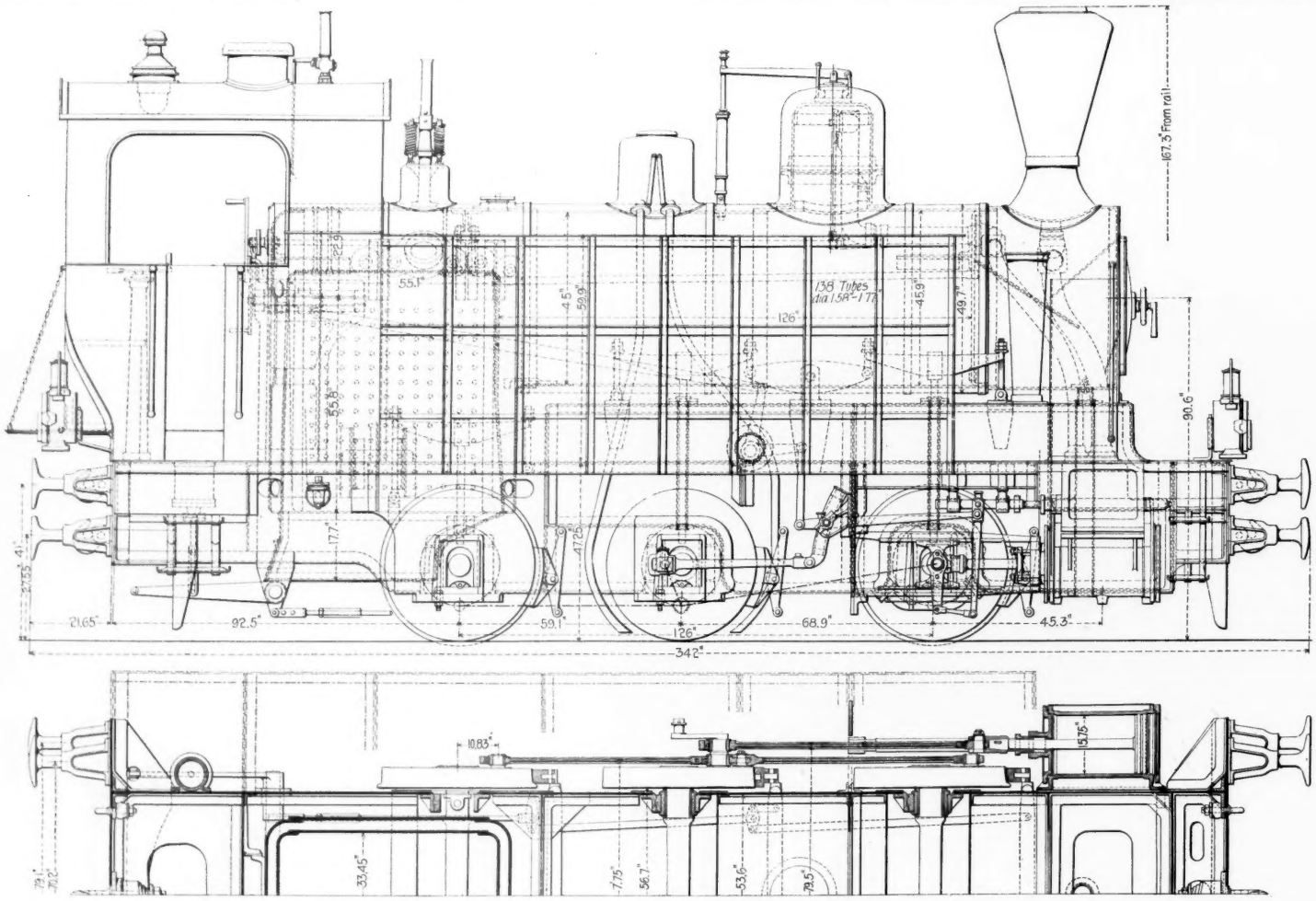
Diameter of cylinders	15.75 in.
Stroke of pistons	21.65 in.
Diameter of driving wheels	40 6 in.
Boiler pressure	170 lbs.
Least diameter of boiler shell (inside)	45 in.
Thickness of plates (mild steel)	0.51 in.
Number of tubes	138
Diameter of tubes	1 77 in. outside and 1.58 in. inside
Length between tube plates	126 in.
Material of tubes	Iron
Material of inside firebox	Copper
Thickness of sheets, sides and back	0.59 in.
" " crown sheet	0.67 in.
" " tube plate	0.99 in.
Heating surface, firebox	79.1 sq. ft.
" " tubes	672 sq. ft.
" " total	751.1 sq. ft.
Grate surface	13.4 sq. ft.
Capacity of water tank	211 cu. ft.
" wood bunkers	353 cu. ft.
Weight of engine empty	61,700 lbs.
" " in working order	88,200 lbs.

The general features of the engine are clearly shown by the drawings. In settling upon the dimensions it was desired to have an engine which should be easily able to pass over the rough contractor's lines used during the construction of the railroad, but which should have sufficient endurance in firewood and water to enable it to perform local train service after the completion of the railroad. To this end the main driving wheels are without flanges—a very questionable feature in a six-wheeled engine, and which would not be permitted on the great majority of European lines. The water tank and bunker capacity are very large; so large, indeed, as to increase the weight of the engine to a degree which, according to prevailing European opinion, is objectionable for constructional work, bearing in mind the makeshift character of contractors' lines; and in this case, also, the poor quality of the steel used for the rails.



Trans-Manchurian Locomotive

The water tank, as is seen, is placed between the frames, of which, indeed, the latter form the sides. The whole arrangement effectually stays the frames and allows their thickness to be reduced to the very low figure of 0.394 in. This arrangement brings the center of gravity down low, and thus adds to the stability of the engine for low-speed work over rough lines. It has also the merit of neatness, as compared to the saddle tanks in common use in England: but it is, nevertheless, a good illustration of the inadvisability of forcibly coupling two things bearing no relation to each other. These between-frame tanks were at one time in great favor, for the reasons above named, but are now rarely recommended by



Tank Locomotive for the Trans-Manchurian Railroad.

engine builders, and in this case were prescribed solely by the railroad administration. As the frames are exposed to the racking strains due to the steam pressure and the irregularities of the track, it is usually a difficult matter to keep the tank tight; besides which the frames are eaten by rust, and this action is, of course, favored by the continual, though very small, motion of the various component parts, which favors the infiltration of the water into the closest joints. In point of fact, the attention of the railroad officials was specially drawn to this disadvantage by several engine builders who were invited to tender.

The engine, as will be seen from the dimensions given, is of ample power for its particular use; it has Walschaert valve gear, with Allen valves of phosphor bronze, steel pistons with cast-iron rings, the usual patttern of screw reversing gear, fluted connecting and coupling rods, slide valve pattern of regulator, American chimney, and steam brake acting on all the wheels.

The engine is provided with a double set of draw gear and buffers at each end, so that it can haul the special low, ballast trucks used for banking purposes, etc., as well as ordinary Russian rolling stock, after the completion of the line. The gauge is, of course, the Russian standard, that is, five feet English.

It only remains to add that the engines are built in the excellent style and finish characteristic of the best German engine works, and of the Hanover firm in particular.

Note on a Test of a New Paint Oil.

By William G. Raymond.*

For some seven or eight years I had been familiar with the name lucol, and had known it to be a paint oil substitute for linseed oil. Its merits had been brought to my attention and I had been asked to specify it. From what little I had seen of its working I was satisfied to permit its use, but hesitated to specify it to the exclusion of linseed oil for painting either wood or iron.

Some three or more years since a small brick building front in Troy was painted half with lucol oil and half with linseed oil, both mixed with the same pigment, and, as I am informed, each half of the front having had two coats of paint.

After some six months the appearance of the building was as shown in Fig. 1, which is a photograph taken by myself. The left half is lucol paint and the right half linseed paint. At the present time the spotted appearance has largely disappeared, but the color of the linseed front has faded more than that of the lucol front, though the apparent relative merits of the two oils vary according to the light in which the building is viewed.

The spotted appearance of the linseed oil front is accounted for thus: The more porous brick absorb so much of the linseed oil that the pigment is left dead on the surface. The lucol oil seems to fill and close the pores of the material on which it is placed better than the linseed oil, and hence the absence of such spotted appearance on the lucol front. Some time before this one of my neighbors had ordered his house painted with lucol oil paint, and I knew that he was well satisfied with the result.

A representative of the lucol oil had so earnestly assured me of its durability under the hard usage to which any painted iron surface connected with railroad depot structures is subject that I determined to make a simple, but severe, test of the oil in such exposure.

Accordingly, I secured a number of steel bars, shown in Fig. 2, some lucol ready-mixed red lead paint, some raw lucol oil, some raw and boiled linseed oil and some red lead, all purchased of reliable dealers. The flat bars were ordinary bar steel, carefully cleaned of scale and rust, while the round bars were smooth steel shafting, entirely free from any scale or rust. I procured the services of a first-class painter to mix the paints and to paint the bars. None of the bars received any paint on the upper two or three inches.

Bars 1, 2, 4, 5, 6, 8, 10 and 11 have had no outside exposure, which accounts for their clean appearance. Bars 3, 7, 9, 12, 13 and 14 were hung for about three months in the trainshed of the Troy Union Depot, at the end of which time they were all in fairly good condition, except that all had faded to a dirty white. They had been hung directly over the standing-place of the Fitchburg locomotives. The bars were then hung in one of the ventilating windows in the north end of the depot, where they would be subject to the weather, as well as to the smoke and steam, and they were left in the window for about one year, with the result indicated in Fig. 2. This end of the depot was formerly of sheet-iron painted with Prince's metallic and linseed oil, and its life was a short year. Bars 1, 2 and 3 were painted, upper half one coat, lower half two coats, with raw linseed oil and red lead, 24 pounds of pigment to the gallon of oil. That it sagged and ran badly is shown in the figure. Bars 4 and 5 were painted in the same way, using 32 pounds of pigment to the gallon of oil. The sagging was not nearly so much, but was still considerable.

* Professor Geodesy and Road Engineering in the Rensselaer Polytechnic Institute.

Bars 6, 7 and 8 were painted as were the others, but with 37½ pounds of pigment to the gallon of oil. In these bars the sagging is hardly perceptible; the brush marks are very plain. Bars 9 and 11 were painted one coat only of lucol ready-mixed red lead paint. It should be remarked that it is pretty well known that a mixed paint cannot be made with red

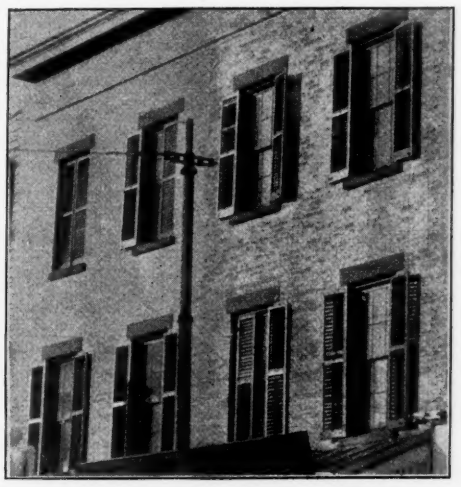


Fig. 1 —Tests of a Paint Oil.

lead and linseed oil. Bar 10 had two coats of the same paint, and bars 10 and 11 show absolutely no sag, and there was no running with this paint; it seemed to spread on—"flow," the painter called it—like a varnish. Bars 12 and 14 had two coats of boiled linseed oil with 32 pounds of red lead to the gallon of oil, while bar 13 had on its upper half one coat and on its lower half two coats of raw lucol oil with 18 pounds of red lead to the gallon of oil, the paint being mixed by hand by the painter just as the linseed paints were mixed.

It will be observed by comparing the unexposed bars that the lucol bars, 10 and 11, have less lustre than the linseed bars. This is not always a desirable quality, but for undercoats is quite so. The lucol bars dried more rapidly to a condition for handling and second-coating than the linseed bars, but have never become so hard as the linseed bars. This might indicate the necessity for somewhat more careful handling of heavy iron structural work in shipping; but it also seems to indicate longer life for the paint.

The lustre of the boiled linseed bars was at first greater than that of the lucol bars, but after some months the lucol bars had more lustre than the linseed bars.

The result of the 15 months' exposure was to reduce the thickness of the bars on the unpainted ends about $\frac{1}{16}$ inch. This indicates the severity of the test.

A single coat of raw linseed oil with 24 pounds of red lead to the gallon (bar 3) was very little protection, as were also two coats of boiled linseed oil with 32 pounds of pigment to the gallon (bars 12 and 14). Two coats of raw linseed oil with 24 pounds of pigment per gallon (bar 3) gave about as good protection as a single coat of raw linseed oil with 37½ pounds of pigment per gallon (bar 7). Two coats of linseed oil with 37½ pounds of pigment per gallon (bar 7) seems to have given about the same protection—rather less—as one coat of lucol mixed paint (bar 9). But a curious thing here is that under the apparently still sound paint on bar 7 (linseed) was a thin coating of rust, while under the apparently sound paint on bar 9 (lucol) the metal was still clean and bright. I could not detect any indication of rust under the sound paint on any of the unexposed bars.

The bar standing the test best of all is the lower half of bar 13 (lucol oil with 18 pounds of red lead per gallon). Except at the edges this bar is still practically sound.

Some tests with weak ammonia water ludicate that the lucol paint is unharmed by alkalis and the tests herein recorded seem to show it to be much less readily attacked by the acids of smoke fumes than is linseed oil. I have seen some chemical analyses of lucol oil put forward with the statement that it contains substances injurious to iron, and that its use as a covering for iron is therefore unwise. I do not know what it contains, but the practical test here outlined shows that whatever is in it that could be injurious to the iron is so combined that instead of corroding the iron it is actually, when used with red lead, a better protecting coat than linseed oil with the same pigment, and covers better with less of the pigment.

In a comparatively recent article on the result of a series of tests of various paints on metal, it is assumed that paint is a mixture of some pigment with linseed oil, and the line of tests was arranged to show what pigments are best to use, the pigment apparently being supposed to be the life of the paint. This is a notion, held by some chemists, that does not appeal to me as reasonable. Really, it seems to me that the oil is the life of the paint. So long as it remains unoxidized the paint is good. It is true that not all materials make good pigments. Linseed oil, when mixed with some pigments seems to oxodize more rapidly than when mixed with other pigments, and hence if paint is to be considered to be a mixture of some pigment with linseed oil there may be some excuse for the idea that the pigment is the life of the paint, since different pigments seem to affect the life of the oil differently.

But may it not be possible, judging from the results obtained in the test herein described, that there are other oils than linseed oil?

A series of tests of painting materials should not be entirely chemical; indeed, they should only be chemical at all to the extent of determining whether the articles used are what they are represented to be, and what the product of exposure is. The only real test worth anything at all is for a paint as for a pudding. A series of practical tests consisting of actual exposures to actual and usual conditions, is the only series that can give results worthy the consideration of the practitioner. Such a series should be arranged not only to show what is the best pigment to use with linseed oil, but what is the best oil to use with a given pigment and for a given exposure. It seems to me that such a series of tests is highly desirable in connection with the investigation of paints proposed by the American Society of Civil Engineers.

For my own part, I shall have no further hesitancy

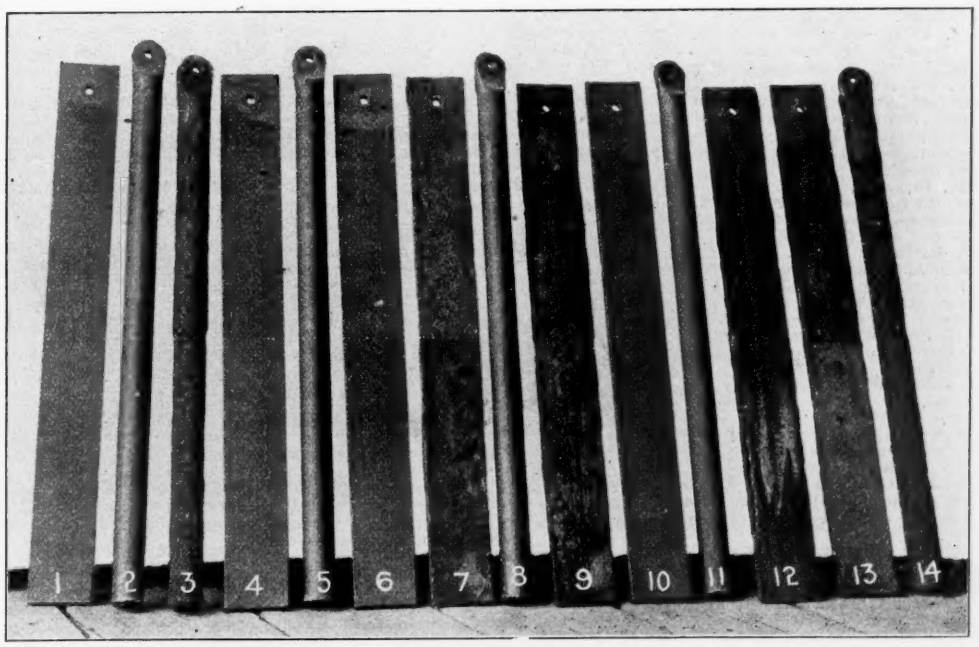


Fig. 2 —Tests of a Paint Oil

in specifying lucol oil, and particularly for painting iron structures connected with railways and factories, exposed to the action of coal smoke. For car and depot painting this oil would seem to be particularly adapted. Its quality of resisting the action of weak alkalis would seem to indicate it as a useful protecting material for bridge floors subject to refrigerator car drippings.

I am told that it has been used with great success on the Brooklyn Bridge, and that it has proved to be

one of the very best protective coatings on the penstocks of the Cataract Construction Company.

Electric Heating.

The Safety Car Heating & Lighting Co. has brought out an electric motor for which is claimed an efficiency better than has ever before been obtained, due to free circulation of the air through and around the heating coils. The ordinary disposition of this heater in a street car is shown in Fig. 1, and Fig. 2 shows an arrangement for the heater to be put under seats without panels, which form can be fastened to the floor or the side of the car or underneath the seat.

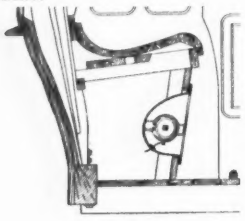


Fig. 1.

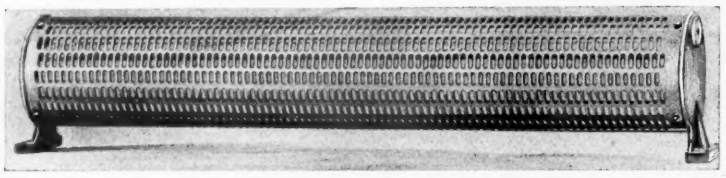


Fig. 2.—Electric Car Heater.

The heater consists of a resistance coil and non-oxidizable wire, which is wrapped back and forth around the core, the core being built up, as shown in Fig. 3, of sections of porcelain placed on a square iron bar. The looping of the coil around the core is shown in Fig. 4, which is a rear view of the core. Special attention is called to the fact that underneath the resistance coil there is a groove formed by the porcelain sections of the core. This allows the circulation of the air between the resistance coil and the core, increasing the radiating surface of the coil and the effectiveness of the heater. The resistance coils may be easily cleaned of an accumulation of dust or dirt by a jet of compressed air, thus keeping them in their most efficient condition, and also lessening the disagreeable smell of burning organic matter which may accumulate on the heater.

Train Accidents in the United States in March.

COLLISIONS.

Rear.

2d, on Atchison, Topeka & Santa Fe, at Rome, Kan., a mixed train descending a grade broke in two between the passenger car and the last freight car; and the forward portion having been stopped at the station soon after, was run into by the passenger car. One trainman and 6 passengers were injured.

4th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Scio, O., a freight train broke in two, and the rear portion afterward ran into the forward one, wrecking 5 cars. The conductor and 1 brakeman were injured.

5th, on Yazoo & Mississippi Valley, near Memphis, Tenn., a passenger train ran over a misplaced switch and into a freight car standing on a side track. The engineman was injured.

8th, on Philadelphia & Reading, near Dauberville, Pa., a freight train ran into the rear of a preceding freight, wrecking the engine and 7 cars. The fireman and 1 brakeman were injured.

9th, on Lake Erie & Western, at Walkerton, Ind., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking several cars. Three boys stealing rides were killed.

9th, 10 p. m., on Erie road, at Fair Lawn, N. J., a freight train broke in two, and the rear portion afterward ran into the forward one, wrecking 7 cars. A brakemam was injured.

17th, on Ohio Central, at Kenton, O., a freight train broke in two, and the rear portion afterward ran into the forward one, damaging several cars. The conductor and 1 brakeman were injured.

22d, on Western Maryland, near Hagerstown, Md., a freight train, which had stopped to leave some cars, was run into at the rear by a following freight drawn by 2 engines, making a bad wreck. One of the engines fell down a bank. Three trainmen were injured.

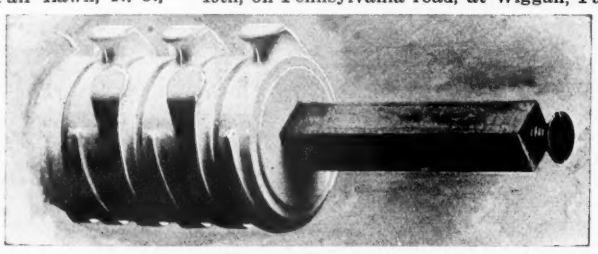


Fig. 3.—Core of Electric Heater.

27th, on Pittsburgh & Lake Erie, at Brightwood, Pa., a freight train broke in two, and the rear portion afterward ran into the forward one, wrecking several cars. A brakeman was injured.

29th, 2 a. m., on Erie road, at Cameron, N. Y., an eastbound freight ran into the rear of a preceding freight, wrecking the caboose and several cars. A brakeman was injured.

And 23 others on 23 roads, involving 1 passenger train and 33 freight and other trains.

Butting.

7th, on Norfolk & Western, near Island Ford, Va., butting collision of freight trains, making a bad wreck. One fireman was killed and 4 other trainmen were injured.

8th, on Southern Pacific, near Ocean View, Cal., butting collision between a passenger train and a freight. The passenger conductor was injured. It is said that the freight train had encroached upon the time of the passenger.

19th, on Burlington & Missouri River, at Nebraska City, Neb., a freight train ran over a misplaced switch and into the head of another freight train, badly damaging both engines. Two trainmen were injured.

22d, on Chicago & Northwestern, near Roscoe, Ill., butting collision between a passenger train and an empty engine, badly damaging both engines and 1 baggage car. One engineman and 1 brakeman were killed, and 2 passengers and 3 trainmen were injured.

23d, on Tennessee Coal, Iron & Railroad Company's line, near Ensley, Ala., butting collision of locomotives badly damaging both. One engineman was injured.

29th, on New York, Chicago & St. Louis, near Angola, N. Y. butting collision between westbound passenger train No. 5 (second section) and eastbound passenger train No. 6. Both trains were running slowly at the time. The engineman of the eastbound train jumped off and broke his arm.

30th, 3 a. m., on Western & Atlantic, near Adairsville, Ga., butting collision of northbound freight train No. 10 and southbound freight No. 17, both running at full speed. Both engines and many cars were totally wrecked. The engineman of the northbound train was killed, and the fireman of this train and the engineman of the other were injured. It is said that the engineman of the southbound train misread a telegraphic order.

30th, on Southern Pacific, at French Camp, Cal., a passenger train ran over a misplaced switch and into the head of a freight engine standing on the side track. Both engines were badly damaged, and 1 passenger car fell down a bank. The fireman of the passenger train was killed and 3 passengers and 2 employees were injured.

And 7 others on 7 roads, involving 2 passenger and 12 freight and other trains.

Crossing and Miscellaneous.

4th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Cherry Grove, Ind., a northbound train entering a side track was run into at the middle by a southbound train, which approached at uncontrollable speed. Four loaded cars were wrecked and 2 trainmen were injured.

23d, at York, Pa., a freight train of the Northern Central struck the rear car of a passenger train of the Pennsylvania at the junction of the two roads, damaging the engine of the freight and derailing the rear car of the passenger train. The passenger engineman saw the freight approaching at uncontrollable speed, and by promptly increasing his speed succeeded in very nearly clearing the crossing before the freight reached it.

25th, on Atchison, Topeka & Santa Fe, near Sixteenth street, Chicago, Ill., collision between a switching freight train and a passenger train, damaging 1 passenger car. One passenger was injured.

31st, on Baltimore & Ohio, at Lodi, O., an engine left unattended was run into by another engine, and, the throttle being jarred open, ran about 5 miles toward Creston, and collided with a freight train, badly damaging both engines.

And 14 others on 13 roads, involving 8 passenger and 15 freight and other trains.

DERAILMENTS.

Defects of Road.

10th, on East & West of Alabama, near Rigland, Ala., a mixed train broke through a trestle whch had been weakened by fire, and the engine and several freight cars were wrecked. The engineman was killed.

12th, on Vandalia Line, near Terre Haute, Ind., a switching freight train was derailed by a broken rail, and the engine was ditched. The fireman was injured.

15th, on Pennsylvania road, at Wiggan, Pa., a coal train, consisting of an engine and 12 cars, broke through a trestle bridge and, with about 100 ft. of the bridge, fell to the ground, about 40 ft. below. Seven trainmen were injured.

22d, on Cleveland, Cincinnati, Chicago & St. Louis, near Laura, O., passenger train No. 18 broke through a small trestle which had been weakened by a flood, and the engine was nearly submerged. The engineman and fireman were injured.

23d, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Frazeysburg, O., a passenger train of the Baltimore & Ohio was derailed at a point where the road was damaged by high water, and the engine and some of the cars were partially submerged in Wakatomika Creek, which was very high.

23d, 6 p. m., on Pittsburgh, Cincinnati, Chicago & St. Louis, near Columbus, Ind., a work train running at slow speed broke through a trestle bridge and nearly or quite all of the train fell into the White River, which was very high. Of the 20 or more persons on the train nearly all were injured by the wreck or suffered from exposure, being submerged in the water and rescued with difficulty. One brakeman was fatally injured. The fireman was carried some distance down stream, and succeeded in getting into a tree, but it was impossible to rescue him for about 12 hours. All help for the people in the wreck had to be sent by boats across a wide swollen river.

And 7 others on 7 roads, involving 2 passenger trains and 5 freight trains.

Defects of Equipment.

8th, on Philadelphia & Reading, at Klapperthal, Pa., a passenger train, consisting of 9 cars, was derailed while running at high speed by a broken wheel. The running gear of the first 2 cars was completely wrecked, and the bodies of these cars barely escaped falling into the Schuylkill River.

29th, on Buffalo, Rochester & Pittsburgh, at Caledonia, N. Y., a freight train was derailed by a broken wheel, and 9 cars were ditched, some of them falling down a bank. The conductor was injured.

And 21 others on 20 roads, involving 1 passenger train and 20 freight and other trains.

Negligence in Operating.

1st, on Rome, Watertown & Ogdensburgh, at Norwood, N. Y., a passenger train was derailed while entering a side track, and the express car and 2 freight cars standing on an adjoining track were badly damaged. The express messenger and the baggageman were injured. The train was run upon the side track because the main line was blocked by cars which had been derailed, and the engineman was not warned in time to slacken his speed.

1st, on Cleveland, Cincinnati, Chicago & St. Louis, at Harper, O., a freight train entering a side track was not properly controlled, and ran upon the ground at the farther end of the siding. The two engines drawing the train and 19 cars were overturned. Both enginemen were injured.

2d, 3 a. m., on Wisconsin Central, at Franklin Park, Ill., a freight train was derailed by the derailing switch approaching the crossing of the Chicago, Milwaukee & St. Paul. The engine and 5 cars were wrecked, and a brakeman was killed. It appears that the train approached at uncontrollable speed and disregarded the signal.

2d, on West Shore road, near Fayetteville, N. Y., a freight train loaded with ice became uncontrollable on a descending grade, and was derailed, a large number of cars being ditched. The engineman and 1 brakeman were killed and 2 other trainmen were injured.

4th, on Pennsylvania road, at Howellville, Pa., a freight train was derailed at a point where a rail had been taken out for repairs, and 12 cars were ditched. The engineman was injured.

5th, on Cleveland, Cincinnati, Chicago & St. Louis, at Cairo, Ill., a train of freight cars being run down a steep grade to the transfer steamboat became uncontrollable, and ran off the end of the track at considerable speed, landing in the river. Three brakemen jumped off, and were injured.

7th, on Cincinnati, Hamilton & Dayton, near Austin, O., a freight train ran off the track at a place

Fig 4.

where a rail had been taken out for repairs, and several cars were ditched. The engineman was injured. It is said that a flagman was sent out, but failed to properly signal the train.

11th, on Union Pacific, Denver & Gulf, at Falcon, Col., a passenger train ran over a misplaced switch and on to a side track. The speed of the train was not properly controlled, and the train ran through the side track and was derailed by the derailing switch at the farther end, the engine being overturned. One passenger was injured.

15th, on Pennsylvania road, at Trenton, N. J., the engine and 2 cars of a passenger train were derailed by a misplaced switch. The engine fell into a creek.

23d, on St. Louis, Arkansas & Texas, at Tyler, Tex., a freight train was derailed by a misplaced switch, and the engine and 2 cars were overturned. A brakeman was killed.

And 5 others on 4 roads, involving 2 passenger and 3 freight trains.

Unforeseen Obstructions.

2d, on Atlanta, Knoxville & Northern, near Canton, Ga., the locomotive of a passenger train was derailed by a malicious obstruction on the track, and the engineman was injured.

17th, on Wheeling & Lake Erie, at Hurford, O., a work train, moving backward, was derailed by running over a stone, and the caboose and 6 cars were wrecked. Four employees were injured, one of them fatally.

23d, on Pittsburg & Western, at Carbon, Pa., a freight train was derailed by a landslide and the engine and 10 cars were ditched. A brakeman was killed and 2 other trainmen were injured.

25th, on Denver, Leadville & Gunnison, near Garos, Col., a mixed train was derailed, and several cars fell down a bank. Three passengers and 3 employees were injured. It is said that the cars (narrow gage) were blown off the track by a high wind.

26th, on Atchison, Topeka & Santa Fe, near San Antonio, N. M., a freight train was derailed by a malicious obstructon, and several cars were wrecked. The engine fell down a bank.

28th, on New York, Chicago & St. Louis, near Ripley, N. Y., a freight train was derailed by the roof of a car which had been blown from a car of a previous train, and the engine was overturned. Three trainmen were injured.

29th, on Cleveland, Cincinnati, Chicago & St. Louis, near Bloomington, Ill., a passenger train was derailed on a bridge, and a part of the cars fell into Kickapoo River. It is said that the track had been disturbed by the displacement of the bridge by high water. Fifteen passengers were injured, one fatally.

And 3 others on 3 roads, involving 1 passenger train and 2 freight trains.

Unexplained.

14th, on Missouri Pacific, near Warrensburg, Mo., a freight train was derailed, and 18 cars were wrecked. A tramp stealing a ride was injured.

14th, on Kansas City & Northern Connecting, near Trimble, Mo., the engine of a freight train was derailed and, with 1 car, fell off a bridge into a creek. The engineman was killed, and the fireman and 1 brakeman were injured.

28th, on Chicago & Northwestern, near Rockford, Ill., a passenger train was derailed, and the fireman was fatally injured. The engineman was also hurt.

30th, on Staten Island Rapid Transit, at St. George,

N. Y., a passenger train was derailed, and 1 car fell over against a locomotive standing on a side track. One brakeman and 5 passengers were injured.

And 33 others on 26 roads, involving 2 passenger and 32 freight and other trains.

OTHER ACCIDENTS.

1st, on Boston & Albany, at Brighton, Mass., a switching engine was wrecked by the explosion of its boiler, and the fireman was badly injured.

16th, on Southern Railway, near Henry Ellen, Ala., a passenger train ran over a misplaced switch and on to a side track, and the engine was damaged by running against a coal tipple, the clearance not being wide enough for anything but narrow coal cars. The cab was badly damaged, and the engineman was injured.

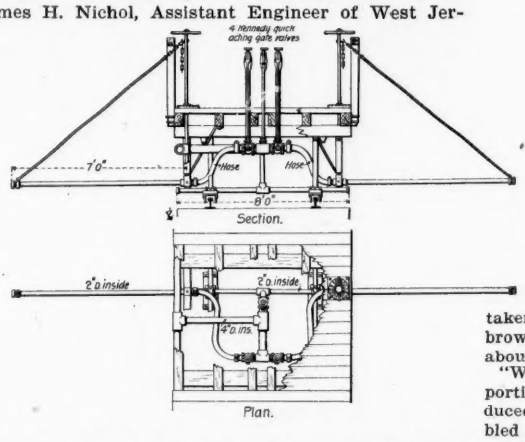
22d, on Missouri, Kansas & Texas, near Smithville, Tex., the locomotive of a freight train was wrecked by the explosion of its boiler, and 5 cars were ditched. The engineman and fireman were injured.

And 5 others on 5 roads, involving 4 passenger trains and 1 freight.

A summary will be found in another column.

Oil Sprinkling Car—Long Island Railroad.

The engravings show the details of an oil sprinkling car now building by the Long Island Railroad for coating the ballast of that road with oil to lay the dust. This method, devised and patented by Mr. James H. Nichol, Assistant Engineer of West Jersey & Seashore Division of the Pennsylvania Railroad, was described in our issue of Aug. 6, last, and the experience of that road has been so satisfactory that a company has been organized (The Dustless Road Bed Co.), from which the Long Island has secured a license to use the process and will at once sprinkle about 100 miles.



The car shown is for carrying and manipulating the sprinkler, the oil being stored in ordinary commercial tank cars. A 4-in. pipe runs the length of the car with provision at either end for making connection by rubber hose to the oil supply. From this pipe a branch pipe, near the middle of the car, carries the oil to three sections of 2-in. pipe, one suspended transversely below the car, the length of the cross-ties, and one swing section at either side which, when extended, will reach two or more feet up the sides of slopes in cuts. Slits are cut in the under sides of these pipes 1-16 in. wide by 3 in. long. The side pipes are each connected to the main pipe line by rubber hose so that these sections can be raised or lowered to conform to the surface of the roadbed. The adjustment of each side sprinkler is made by a hand wheel at the top of a vertical staff about which is wound a chain which supports the outer end of the pipe. Winding up this chain raises the side sprinkler, which is held in any position by a ratchet device near the base of the staff. This ratchet is clearly shown by the detail drawing.

The flow of oil from each pipe is controlled by a 4-in. quick-acting, Kennedy gate valve worked by a lever, in addition to which globe valves are placed in the main supply pipe near either end of the car. A special connection, B, is provided which may be screwed into the rear end of the supply pipe and to which three lengths of rubber hose fitted with hand sprayers can be attached for sprinkling portions of the roadbed beyond the reach of the fixed pipes. To prevent oil coming in contact with the rails, shields 20 in. long are placed above the rails and directly below the oil pipes; these are also shown in detail.

The oil used for this work is non-combustible, and when first applied has a slight odor, not offensive, which is lost after a few days' exposure. The experience of the West Jersey & Seashore Division shows that the quantity of oil used per mile is about 2,000 gals. When at work the train consists of the sprinkling car, a tank car for oil and a locomotive which, besides hauling the train at about four miles an hour, supplies compressed air or steam to aid in ejecting the oil.

The use of oil in this way promises to remove one of the greatest objections to gravel, sand and cinder ballast, namely, the dust. A dustless roadbed would, to the motive power man, suggest reduced wear of the moving parts of the machinery, less wear of journals and fewer hot boxes, while to the track man the action of the oil in preserving the crossties and preventing the growth of weeds and vegetation in the ballast would be important features.

As explaining some of the advantages of oil for laying dust, the following statements from a letter written by Mr. C. L. Addison, General Road Master of the Long Island Railroad, are important:

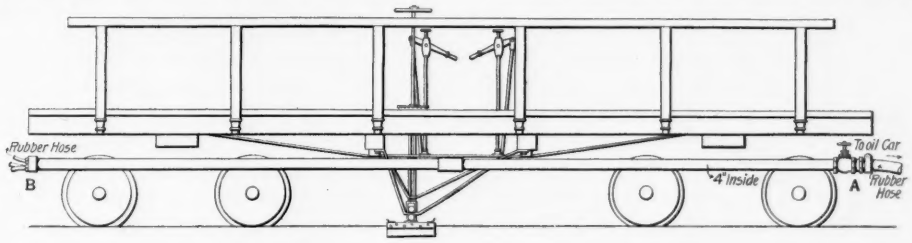
"There is undoubtedly a wide field for this method of keeping down dust. Sand, loam, sandy gravel and old soft coal cinder ballast will be much benefited by the application of oil, but broken stone, slag or clean gravel are practically clean, and an application of oil to such ballast would be useless. Tamping, renewing ties, &c., break up the surface of the oiled ballast, and wherever this occurs there will be a slight puff of dust after the passage of fast trains. This dust being in small quantities and not continuous, does not rise high enough to enter coaches.

"One application of oil should last through the Summer months, and as it is our practice to renew ties in the Fall, we do not anticipate any general breaking up of the oiled surface during our busy season. One application penetrates the ballast to a depth varying from 1 in. to 2 in., and we expect that yearly applications, for four years, will thoroughly saturate the ballast to the bottom of the ties. When this is accomplished, tamping and tie renewals will not turn up dry sand.

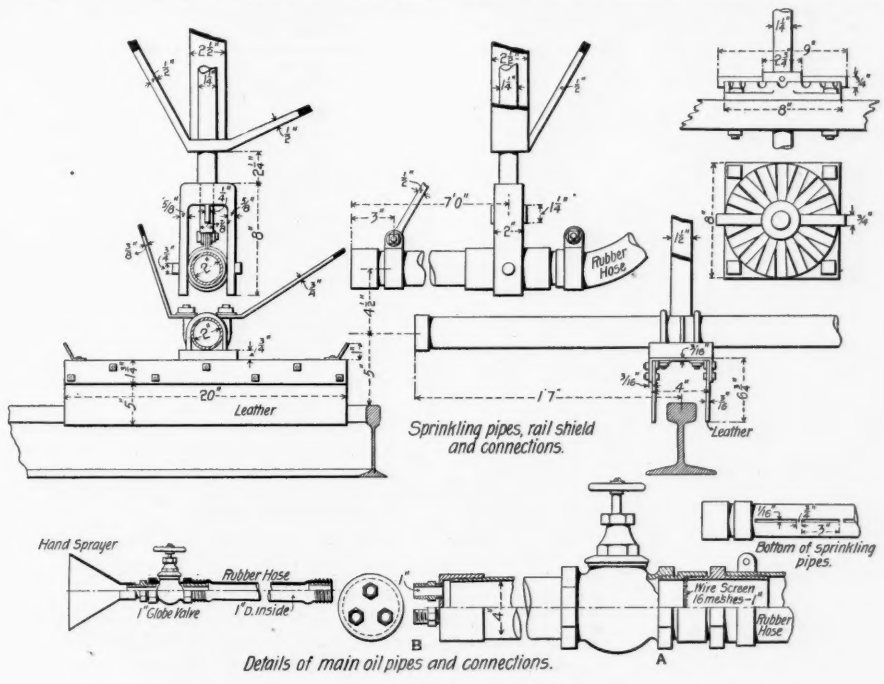
"I made an experiment last September on the slope of one of our very light sand fills through the Shinnecock Hills, and found that where four applications were made the oil penetrated to a depth of 8 in., and sand taken from this depth had the appearance of light brown sugar. This sand, before treatment, was of about the same weight as beach sand.

"We have quite a number of cuts through the middle portion of the Island, where vegetation cannot be induced to grow upon the slopes, and we are much troubled by sand washing into the ditches during rainy weather. It is our intention to properly smooth up these slopes and treat them with one application of oil, and the experiment mentioned above convinces me that we shall not have this trouble after the slopes have been so treated.

"While the effect of oil on ballast in preventing heaving has not been touched upon, it may prove that heaving will thus be prevented. If water is excluded from the ballast, there can be no freezing. We can, however, scarcely expect any marked results in this direction until the ballast has been treated three or four times and become thoroughly saturated."



Oil Sprinkling Car for the Long Island Railroad.



Details of Oil Sprinkling Car.

Norfolk & Western Train Rules.

The Norfolk & Western has lately issued a revised book of regulations for the government of the operating department. In the main it conforms to the Standard Code in the train rules and rules for the movement of trains by telegraphic orders, but there are important variations.

The "general notice" at the beginning of the book is in part like that which was in the Standard Code up to 1896. Following this are 283 "general rules" for the different classes of employees, including telegraph operators, master carpenters, bridge watchmen, etc. These rules, so far as we have observed, do not follow the order in which they are found in the codes of other prominent roads, so that the Norfolk & Western in this respect does nothing to promote uniformity, but the rules appear to have been prepared with great care by a man who is not only well informed as to what a code should contain, but is also a master of English. A few rules are printed in full-faced type. This is a device which has been almost or wholly excluded from the Standard Code, but in the code before us it is used sparingly and with intelligence.

In a hasty glance through this part of the code we notice a few peculiarities: Rule 84 requires that when the rear portion of a freight train is left standing on the main track at a station while work is being done a brakeman must be left in charge of it, if the grade is such that the cars would start back if the brakes were released. The regulations for ejecting persons from trains specify, in each case, both passenger and freight trains. If a conductor has collected fare from a passenger he must offer to refund it before putting him off. Conductors must keep in their possession the latest condensed time table issued by the passenger department. Trainmen must not occupy seats with passengers. Firemen "must not permit enginemen to sleep upon their engines while upon the road." Telegraph operators must not converse about train accidents; particulars for the public or for publication will be furnished only by an officer of the railroad company.

The train rules begin with No. 301. The first 11 rules are similar in substance to the general rules, Nos. 1 to 12, of the Standard Code. Beginning with No. 312 the Standard Code is conformed to. Numerous additions are made to the rules, and these are designated by letters, as 365(a), 365(b), etc. Whenever a rule has been changed, even slightly, from the wording of the Standard Code, the fact is indicated by a change in the number. For example, the code reads: "339. Omitted;" then follows Rule 339(a), which is precisely like Standard Rule 339, except that drawbridges are included. We note certain additions. Rule 315: When clocks are not in working order the faces must be covered. Rule 318: Conductors lying over night away from headquarters must get standard time from the Superintendent in the morning, if they cannot compare with a conductor or engineman. The road-crossing whistle must be given by extra trains at tunnels and other obscure places. One blast of the signal whistle is used at terminal stations in testing air-brakes, but no other use is prescribed for it. Fusees must not be placed on bridges or where they can set fire to anything. Rule 386 and other time-interval rules are so amended as to require a block section to be cleared before a superior train is due to enter such section. All trains must approach all stations, water tanks

(Continued on page 313.)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

Published Every Friday,

At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

In this issue Mr. R. P. C. Sanderson makes an argument for cast-iron car wheels, in which the relative merits of cast-iron and steel-tired wheels are considered. It has been said of Mr. Sanderson that he can always be counted on for something startling, and he certainly has a gift for stirring things up; this time he gives the steel-tired men some profitable reading. We have long maintained that the railroads by paying a fair price, to reputable makers, or by making their own wheels. can get chilled wheels that are safe enough even for passenger service, and the extra cost of the steel tires cannot be considered as insurance against accident, for failures of steel-tired wheels do occur. Mr. Sanderson states that the main arguments which have been advanced for the steel-tired wheel, namely, safety and smooth running, can be met by the cast wheel. In recent chilled wheels the first of these characteristics has been obtained by improved foundry methods, and a better knowledge of the iron mixtures suitable for car wheels, while a valuable check on the quality of the output is given by the thermal test. Smooth running is obtained by grinding the tread, and it is seldom that cast wheels are so far out of balance that this feature need be considered; in any case the cost of balancing is no more for chilled than for steel-tired wheels. As to the wearing qualities, it would appear that the possible average mileage for chilled wheels may soon become 200,000 miles if the makers continue to improve their product as they have lately been doing. The wear and friction of soft steel surfaces in contact with chilled iron are well known to be less than those of two soft steel surfaces used together, so that the wear of the rail head brought in contact with the flanges of chilled wheels is less than that with steel-tired wheels. In the same way train resistance due to flange friction is less for the chilled wheels. In the matter of cost, it is shown that on the basis of the life of steel-tired wheels being 260,000 miles, the net cost of such a pair of wheels for this amount of service is $82.41, leaving out of account the interest on the first investment. To get the same service with chilled wheels, on the basis of the M. C. B. guarantee, which is 60,000 miles, would require 4⅓ pairs of cast wheels, at a net cost of $26.14, or a difference in favor of chilled wheels of $56.27 per pair. In other words, if the net cost of 260,000 miles of service with chilled wheels be represented by 1, the corresponding cost for steel-tired wheels would be 3.15. Mr. Sanderson's argument still remains good if we change somewhat the figures of cost. Furthermore, some of the most important and best managed roads in this country have discarded the steel-tired wheel, so that if weighty precedent is required for adopting chilled wheels for passenger service it is easy to find.

Some Generalities About the Air Brake.

We published week before last a short notice of Senate Document No. 140, being a communication from the Interstate Commerce Commission, giving lists of the railroads of the United States which expected to have all of their freight equipment fitted with automatic couplers and train brakes by Jan. 1, 1898, of those which would have more or less such equipment on by that date, and of those companies that have taken no steps to comply with the act requiring such equipment. The same document includes another table, giving the names of all of these railroads and the numbers of employees killed and injured in each of the five latest years.

The most essential part of this information was published by us Nov. 19, 1897, page 810. There we give a list of all of the railroads owning one thousand freight cars or over, and the percentage of their freight cars which they expected to have equipped with couplers and with train brakes on the first of last January. In looking over that list we find, of course, that the railroads running to the Pacific expected to have more freight cars equipped with train brakes than with couplers; but aside from these roads, the couplers predominate, and often predominate greatly. For instance, the Boston & Albany intended to have 100 per cent. equipped with couplers, and only 60 per cent. with train brakes. On the Boston & Maine the percentages were, respectively, 53 and 41; the Central of Georgia, 71 and 25; the Central of New Jersey, 58 and 20; the Chesapeake & Ohio, 55 and 43; the Chicago & Alton, 38 and 18; the Chicago & Northwestern, 94 and 67; the Big Four, 73 and 35; the Delaware, Lackawanna & Western, 100 per cent. with couplers, 50 with brakes. It is unnecessary to carry these figures further; those which we have given are characteristic.

It has been said that there is as good reason why these railroads should hasten their equipment with air brakes as with couplers. Very likely that is true so far as operating and business reasons go; but one great reason why they do not proceed with the same speed in the matter of brakes is that the law does not require it. While the law provides that all freight cars used in interstate commerce shall be equipped with couplers, it requires the equipment with continuous brakes of only a sufficient number of cars to control the trains. Another reason is, perhaps, the greater cost to put on the air brake equipment. Possibly, still another reason is that the casualties to employees can be reduced more rapidly by fitting with couplers than with continuous brakes. We are not saying what ought to be, but attempting to explain what is.

Apart from these reasons it may be that some railroad officers expected to save for a while some of the cost of equipping their freight cars with air brakes by piping a considerable number of them, so that they can be run in air-brake trains. An interesting discussion on this phase of the subject was held at the March meeting of the Western Railway Club, and reported briefly in our last issue. Mr. Rhodes assumed that it might be well to pipe a certain proportion of old cars which it is not desirable to equip with air-brake apparatus. This can be done very cheaply, because there is no need of putting on stop cocks, and the piping can be used for other cars when these are withdrawn from service. He had lately recommended that one thousand cars be so fitted on the Burlington. Mr. Schroyer, however, stoutly opposed the piping of cars.

It is not easy to say what is absolutely the best policy in general or for any particular road in this matter, but it is well to bear in mind that a really serious objection to piping any large proportion of the cars is that the quick action is uncertain through several cars which are merely piped. Careful and repeated experiments have shown this, and there are some features of the action of the brake in this respect which have not been explained. It has been found, for instance, that as the triple valves are cut out one after another, on a series of cars, the quick action can be made to jump a certain number of cars, but that if then the triples are cut in, one after another, the action of the brakes is sometimes not restored until the number of cars cut out is reduced to perhaps two or three. It is quite obvious that a train with air-braked cars and piped cars, mixed through indiscriminately, is bound to be uncertain and unreliable in its handling by the brakes.

Mr. Schroyer brought out one interesting and important point, namely, that the air brake apparatus is about the most durable part of the whole car and its equipment. Air-brake men sometimes say that there is hardly anything in the property of a railroad, except its right of way, which can be considered so permanent as its air-brake equipment. The earliest triple valves and cylinders put in service are probably still in use, and when one thinks carefully of the construction and duty of the brake apparatus, he can easily understand why this should be so.

All this being true, it follows that it is an error to assume that because a freight car has but few years more of active life it should not be fitted with the air brake. The triple valves, the brake cylinders and the piping after three of four years' use on an old car are still perfectly available for a new car.

Another important point suggested by this durability is the kind of brake apparatus to buy. Obviously, in buying, one would try to get the apparatus that he is reasonably certain to be able to use for many years to come. It would hardly be a good business procedure to buy apparatus which after five years would be outlawed, or for which it would be inconvenient to get repair parts, or which is in any sense experimental. If the air brake is among the most durable possessions of the railroad company it follows, naturally, that the best is the cheapest, and that any other than the best is likely to be dear at any price.

A Demoralized Rate Situation.

The presidents of the roads in the Joint Traffic Association met last Tuesday and considered the very unsettled condition of eastbound freight rates. The report given out is that the whole question was referred to the Board of Managers; but whether this means that tariffs are to be reduced to the very low secret rates known to be actually prevailing, remains to be seen. Evidently the meeting failed to reach a unanimous agreement, and the efforts of the Managers heretofore to agree on a reduction of grain rates have proved futile. Any such thing as a restoration of rates seems to be out of the question.

All-rail rates on export grain from the West have been near a cost basis (or lower) for the last three or four months, and it is probable that a good deal of corn not billed for export has been carried equally low, though the refusal of the Managers last week to authorize a reduction in the open tariff indicates that much grain is still moving at regular rates. We should suppose that all shipments for places short of the seaboard would be in this class, though the claims made by some shippers concerning the concessions they have received indicate that some roads are carrying all grain, wherever it is destined, at the lowest rate that a shipper has the face to ask for. But, of course, the Managers would refuse a reduction, even if the tariff were being obtained on only a very small part of the grain moving, for what good would a reduction do? It would simply make the reduced rates open instead of secret. As all the lines are understood to be secretly cutting, it must be assumed that publication of rates is not deemed important. They are all satisfied to keep on carrying export grain at secret rates (though there will not be much of it during the season of navigation) and some of them evidently take the same liberty with domestic rates. As we cannot assume that every one of these traffic officers is entirely devoid of conscience, we must conclude that they are able to make secret rates in some way that they convince themselves is lawful—but how?

The law requires every road to publish all its local rates, and prescribes some of the details; and it requires the publication of joint rates to such extent as the Interstate Commerce Commission directs. The Commission has ordered that all tariffs be published and that if an export rate is made subject to change when the goods reach the seaboard, such condition shall be shown in the published tariff. How can this be evaded? If the Commission orders a rate reduced, a carrier may lawfully refuse or omit to comply until compelled by a court; but does this privilege apply to an order to publish tarriffs? Certainly it does not, if one may judge by the plain intent of the law. Possibly legal quibblers could make disobedience to the rate-publishing clauses appear permissible, or at least not subject to penalty until after complaint by the Commission; but the language of the Act is quite simple: the Commission (Sec. 6, par. 6) may prescribe the measure of publicity which joint tariffs shall have (and it has prescribed full publicity); and every carrier which shall willingly permit any omission of any act required to be done by the law shall be subject to $5,000 fine. There is no question about the intent of the law, and, what is more to the point, there is no ques-

tion that the order to publish rates is in accord with sound public policy. It may be that the number of days' notice required ought to be modified, but the main point, that rates should be open alike to all shippers, is now so generally approved by the public and by railroad officers that there is no question what the roads ought to do. Why does not the Commission exert itself to get this question tested in the courts? Publication of tariffs would not stop rate cutting, but a determined effort to enforce publication would make dishonorable or reckless rate cutting much more difficult. Of course, a shipper is not going to tell precisely how much of a reduction he has secured to New York or Baltimore, or tell who made it; but if he says he has secured from a railroad any rate at all, through to a European port, he has made out a prima facie case of law breaking against that road, for, as we understand it, no tariff gives any rates at all to trans-Atlantic ports.

Aside from the question of legality and fairness as between competing carriers or shippers, the course of the Joint Traffic lines in their dealings with export grain during the past Winter has been puzzling to many people, because it seemed to be a deliberate sacrifice of revenue. Every road has had use for all its cars, and yet has kept on reducing rates to get more freight away from its competitors. By all the traditions of traffic officers since competition was first known, this is foolishness. The eastward movement of freight has been the heaviest ever known. For the 15 weeks ending March 31 through shipments from Chicago, as reported weekly in our traffic columns, amounted to 2,190,797 tons, or say, at 25 tons a car, 876 cars daily for 100 days. Of this total, 1,264,315 tons was grain. There is no telling how much of the grain was for export or was carried at rates below the tariff, but as Chicago is not the only shipping point, we may assume that St. Louis, and other places not shipping through Chicago, added to the volume of grain for export enough to equal the domestic shipments from Chicago, and thus get a rough basis for speculating on the amount of money that the railroads have sacrificed. Moreover, rates have been cut on provisions and other commodities, as well as grain.

The rates actually made have been reported all the way from 15 cents, Chicago to New York, down to 10. What could have been got by maintenance of rates is uncertain, for the degree of scarcity of cars and the force of the competition of the routes to New Orleans and Galveston are elements that cannot be accurately estimated, but suppose that the loss has been three cents (60 cents a ton). On the 1,264,315 tons this would be $758,589. This was divided among ten roads. The one road that runs through to New York and carries all, or nearly all, of its export grain to New York, has an average of about 11 per cent. of all the shipments out of Chicago. Eleven per cent. of the sum just mentioned is $83,445, a tidy little sum to let slip through one's fingers in three and one-half months. Though this calculation is mostly guess work, the fact remains that just such computations as this, and not so very different from it in magnitude, have been actualities with traffic officers of a dozen roads during the past winter. How can they justify such apparent recklessness?

The most obvious explanation is that they have made so much money from the increased movement of general freight (and passengers) that they have not noticed the loss. The road which we have supposed to have lost $83,445 in three and one-half months gained more than three times that, in gross earnings, in one month. An increase in that ratio might well dazzle an individual, if it affected his personal income, and make him careless and extravagant, but such an explanation does not sound rational coming from a traffic manager; it may explain, but it does not justify.

When earnings are largely increasing throughout the country, and with such fluctuating conditions as have prevailed for the last four years, it may well be that a manager cannot tell far in advance whether his cars are going to be well filled with profitable shipments or not; still, the grain-rate cutting in the West has been too persistent to be excused in this way. To importune a shipper for his goods at rates at or below cost when rates paying a profit can be got on enough freight to fill all one's cars, even if only for a few days, can be justified only by the stock phrase of the soliciting agent, "to take care of our friends." How long this will pass with directors is a conundrum. The only alternative solution of our puzzle is that each railroad wants to show tonnage, whether it really makes anything on the freight or not. As we have seen, this can be done when other freight, paying a profit, is rapidly increasing, and the result concealed in the monthly earnings' statement. The desire to show tonnage, regardless of profit, has been known to afflict soliciting agents from time immemorial, and this is not so very strange; but we seem now to have fallen upon a time when it afflicts traffic managers and presidents.

The spectacle of grain going from Chicago to New York for seven cents per 100 lbs. (10 cents less three cents for lighterage in New York harbor) affords a striking illustration of the marvelous cheapness of transportation on our best railroads today. This rate makes $1.40 per ton. The average distance by four prominent lines is about 960 miles, which would make the rate per ton per mile 1.45 mills, or less than six-tenths of the lowest rate on coal, carried all the way down hill, reported by the Chesapeake & Ohio (annual report 1896). But even at this ridiculous rate there may be no positive loss (and we must conclude that there actually was no great loss), for with the large cars and powerful engines now used the cost of wages and of fuel per ton of freight is exceedingly small. Some of the trunk lines can haul 50 to 60 cars through (with the aid of pushing engines for a few miles); others cannot haul so many, but if we assume an average locomotive load, through, of 40 cars, holding 30 tons each, we have 1,200 tons to the train, bringing in $1,680, or $1.75 per train mile, 12 cents more than the average of all freight trains, carrying high-class as well as low-class freight, in the United States in 1896. If a road has an interest in the lighters which take its grain to the ocean vessels it may get back a part of the three cents allowed for that service, and thus increase its profit or decrease its loss on the rail carriage. We do not make this computation with a view to justifying such low rates, but rather as an illustration of the wonderful engineering and mechanical achievements that may now be witnessed on our railroads every day. The fact remains that such low rates are unjust, for they throw an unfair burden upon the other commodities going over the road. If it is certain that a rate is not below cost (cost including wear and depreciation of roadway, cars and engines), and that the goods cannot be made to move without making the reduction, it may be justified; but in the present case this last condition is precisely what no one admits.

March Accidents.

Our record of train accidents in March, given in this number, includes 66 collisions, 98 derailments and 8 other accidents, a total of 172 accidents, in which 19 persons were killed and 128 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS.	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	16	0	0	16
Misplaced switch	2	4	1	7
Failure to give or observe signal	4	0	3	7
Mistake in giving or understanding orders	0	3	0	3
Miscellaneous	4	1	8	13
Unexplained	7	7	6	20
Total	33	15	18	66

DERAILMENTS.			
Broken rail	2	Misplaced switch	6
Loose or spread rail	2	Careless running	2
Defective bridge	5	Track repairs	2
Defective switch	1	Derailing switch	2
Defective frog	1	Failure to give signal	1
Bad track	2	Runaway train	2
Broken wheel	6	Landslide	2
Broken axle	8	Malicious obstruction	3
Broken truck	3	Accidental obstruction	4
Broken drawbar	3	Wind	1
Airbrake	1	Unexplained	37
Too quick application of airbrake	2		98

OTHER ACCIDENTS.	
Boiler explosion	2
Broken side rod	2
Cars burned while running	2
Other causes	2
	8
Total number of accidents	172

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	13	0	13	8
Defects of equipment	16	23	4	43	24
Negligence in operating	30	15	3	48	29
Unforeseen obstructions	0	10	1	11	6
Unexplained	20	37	0	57	33
Total	66	98	8	172	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	20	20	5	45
Freight and other	88	81	3	171
Total	108	101	8	217

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	5	10	0	15
Passengers	0	1	0	1
Others	3	0	0	3
Total	8	11	0	19
Injured:				
Employees	32	56	4	92
Passengers	12	23	0	35
Others	0	1	0	1
Total	44	80	4	128

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	0	2	28
Defects of equipment	0	0	0	4
Negligence in operating	0	13	9	44
Unforeseen obstructions and maliciousness	1	17	3	12
Unexplained	0	5	2	4
Total	1	35	15	92

Fifteen accidents caused the death of one or more persons each, and 33 caused injury but not death, leaving 124 (72 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with March of the previous five years shows:

	1898.	1897.	1896.	1895.	1894.	1893.
Collisions	66	49	57	36	40	72
Derailments	98	71	72	81	68	102
Other accidents	8	3	5	9	4	12
Total accidents	172	123	134	126	112	186
Employees killed	15	32	18	21	17	36
Others killed	4	8	10	2	5	4
Employees injured	92	47	49	61	63	71
Others injured	36	39	46	19	23	114
Passenger trains involved	45	41	37	36	38	73
Average per day:						
Accidents	5.55	3.97	4.32	4.06	3.61	6.00
Killed	0.61	1.29	0.90	0.74	0.71	1.29
Injured	4.13	2.77	3.06	2.58	2.67	5.97
Average per accident:						
Killed	0.11	0.33	0.21	0.18	0.19	0.21
Injured	0.74	0.70	0.71	0.63	0.76	0.99

The month of March, like the same month in 1897, was marked by serious damage to railroads in the central states by extensive floods. Last year there was a disastrous passenger train accident in Indiana in which five persons were drowned. This year we have four noticeable wrecks due to high water: Laura, O., on the 22d; Frazeysburg, O., and Columbus, Ind., on the 23d, and Bloomington, Ill., on the 29th. In the last-named case one passenger was reported fatally injured. The disaster at Columbus, Ind., was attended by unusual circumstances, and our brief report is a condensation of a stirring account of more than a column in a daily paper. At Frazeysburg one passenger car was submerged, so that the fate of its occupants was not certainly known until four days later.

Other notable accidents in March were those at Franklin Park, Ill., on the 2d; at Roscoe, Ill., on the 22d, and Adairsville, Ga., on the 30th.

A passenger train of the Canadian Pacific was derailed by a broken rail at English River on the 26th; one passenger was killed and a dozen or more injured. A collision resulting in the death of two trainmen occurred near Smith's Falls, Ont., on the 1st.

We have accounts of 11 street car accidents in March, in which 2 persons were killed and 29 injured. One of these was a derailment due to a washout.

Railroads in China.

Apparently Russian progress in the control of the railroads of China is not to be altogether favorable to American interests, for so far as the Russians can control matters, contracts for rolling stock and material are even more likely to go to the Continent than to come to the United States. On April 8, page 255, we gave a short account of the present railroad situation with a sketch map.

The reader will remember that Mukden is an important interior town far to the north of New Chwang and Port Arthur, and that it has long been the purpose of those interested in the extension of the Imperial Railways of North China to carry the existing line northeasterly as far as Mukden and, eventually, beyond. A correspondent who writes to us from Peking now informs us that about the middle of February, orders were given in Peking to at once take steps to build 300 miles of railroad south and west of Mukden. Several orders for material were sent out and others were about to be placed or bids invited, when the Russians heard of the movement and at once shut down on the whole matter and the enterprise was stopped at once. Our correspondent thinks it probable that the rails for this extension would have been placed with the Carnegie mills; and probably locomotives, ties and other material would have been bought in the United States. At any rate, the manufacturers of the United States would have had a fair chance in competition against the Europeans.

The Russian demand is that all the railroads in North China shall be built under her control, and it is openly said that the materials must come from Russia or from her own mills in Belgium. No others are to be asked to bid. "Mr. C. P. Sandberg has a letter from Russian authorities stating this fact, and as he is the Russian government inspector, he ought

to know best. The whole idea is promoted by a crowd of pirates who swarm around the Czar and who, with their friends, will make immense fortunes out of China."

The same writer tells us that Captain Rich (Chief Engineer of the Minneapolis, St. Paul & Sault Ste. Marie), is in Shanghai as advisor to Sheng. This, we suppose, is with relation to the important line southerly from Peking to Hankow. It is questionable if this is carried out, although we suppose that some sort of arrangement has been made for its building by the Belgians. It is easy to see that such a line would not be directly in the interest of the present Russian schemes, for it could be used to bring up troops from the South during the winter, and this might be very embarrassing to Russia as her plans in China develop.

Announcements by railroad companies that they will take back all employees who may enlist in the military or naval service of the United States have been made by a large number of companies during the past week. It would be invidious to name them, as there must be many whose action, reported in local papers, has not come to our notice. In most cases no formal announcement is issued, but in some cases copies of circulars have been given to the newspapers. That of the Philadelphia & Reading, a fair sample, reads:

"Employees of this company who desire to enter the service of the country on account of the hostilities now impending may do so freely under the following understanding as to their relations to this company: Those who accept Government positions, upon leaving Government service at or before the close of the war, and presenting honorable discharges therefrom, will be taken into the service of this company and given positions not lower in rank or pay than they now hold, providing that they shall then be capable of filling such positions.

"This understanding will apply only to those who, upon leaving the Government service, shall return directly to the service of this company and will not apply to those who may accept engagements elsewhere."

A Boston paper says that the Boston & Maine will give employees half their regular pay during their service in the army or navy, but it appears that this applies only to officers or employees who were members of the State militia at the time the circular was issued. The Board of Estimate of New York City has authorized the continuation of the salaries of the employees of the Brooklyn Bridge Railroad who may enter the military service. The Brooklyn Elevated has issued an order stating that if any man enlisting should be entitled to promotion by seniority during his absence, he shall have the promotion on his return. The North Chicago City (street) Railroad will pay half wages to employees enlisting and insure their lives for $2,000 each.

The Mayor and Common Council of Syracuse have consulted the State Railroad Commissioners of New York about appropriating to their city a portion of the State grade-crossing fund, the crossings in that city numbering about 100. As Syracuse is about as badly crossing-ridden as any city in the world, the city officers naturally assumed that a good portion of the $100,000 which has just been appropriated by the State ought to be apportioned to their locality; but Chairman Cole reminded them that their problem, involving an expenditure of perhaps two or three million dollars, was too serious to be taken up except under a comprehensive plan adequate to the conditions. Mr. Cole pointed out that there were about 8,900 other grade crossings in the State, so that the share of Syracuse would be small in any event, not enough to begin work on a single crossing. The Commission evidently intends to begin with crossings in country districts, or where the changes can be made at moderate cost. According to one of the reporters, Mr. Cole thinks that a good many crossings can be got rid of at a cost of $250 each, or less. Evidently the Chairman is misquoted, unless it be that he has found a way of discontinuing crossings without putting up bridges in place of them. The Syracuse application serves to show the great disproportion between the size of the State appropriation and that of the problem it is intended to deal with. Mr. Cole well says that the $100,000 appropriation only is an experiment.

In the ten years up to and including 1893, the number of passengers carried on the railroads of Massachusetts increased at the rate of 5,825,000 a year. The next four years they decreased at the rate of 4,766,000 a year. The decrease in passenger journeys from 1893 to 1897 was more than 19 millions, or 15.65 per cent. This bald statement of fact is astonishing when made of a rich and prosperous State constantly growing in population and wealth. Another strange fact is that while the number of journeys fell off 15.65 per cent., the passenger miles fell off only 6.66 per cent. That is, the average journey grew in length nearly 12 per cent. Of course the discerning reader knows what has happened, the electric railroads have been taking the short trip passengers. Undoubtedly the silver panic of 1893, and the years of hard times that followed (and that the war seems bound to prolong), diminished travel, or at least, prevented its natural growth; but the greatest influence in the falling off on the Massachusetts railroads is, no doubt, the "trolley." Just what share it has had we have no means of knowing, but the last report of the Massachusetts Railroad Commissioners gives some indicative figures. There are six steam railroads that enter Boston. These lost 12.2 per cent. of their passengers into and out of Boston from 1893 to 1897. There are five electric street railroads that enter Boston, and these gained in the same four years 31.2 per cent. in the number of passengers carried. The Commissioners say: "This shifting of traffic is not due to anything that the railroad companies have done or failed to do." They have simply come face to face with a new set of conditions which they cannot yet control.

One of the results of the introduction of electricity on the Berlin street railroads has been a great increase in the business of—the criminal courts! It seems that the Berlin truck driver, like his kind in some other parts of the world, is possessed with the idea that he is sole owner of the street, and he has been driving so that he gets into the way of the cars to such an extent that the police has gathered him in and hauled him before the magistrate, who, with a hardheartedness which we miss in this country, instead of telling him to go and sin no more, has sent him to the lock-up for one or two days, and, in case of a second offence, for a week. Some of the Berlin newspapers fear that when electricity is in use on all the lines the police courts will have more than they can do, from which it appears that they believe the truck driver cannot learn.

NEW PUBLICATIONS.

Roofs and Bridges.—Part IV. Higher Structures. By Mansfield Merriman, Professor of Civil Engineering in Lehigh University, and Henry S. Jacoby, Associate Professor of Bridge Engineering in Cornell University. New York: John Wiley & Sons, 1898. London: Chapman & Hall, Ltd. 8vo. 276 pages, with index. Price, $2.50.

It will be remembered that Parts I. and II. of this work were recently revised and considerable matter added to them. In these last editions it was said that little space was given to drawbridges and none to continuous structures, as these would be treated in Part IV. We have looked forward to seeing these subjects considered fully and clearly in the volume now issued, and we are not disappointed. Cantilever bridges, suspension bridges and arches are also considered at some length, and a number of practical examples are solved to illustrate the methods employed. The stresses are given in thousands of pounds, the word "kip" being used to signify this unit. It is, of course, from kilopound, and, however bad the combination of Greek and Anglo-Saxon may be, it recommends itself by its brevity.

The first chapter treats of continuous structures. As these are now rarely built, especially in this country, except for swing drawbridges, not much space is given to them. The theory of continuity is, however, given fully, that it may be applied in the chapter on drawbridges. These are of three classes, swing, rolling and lift. The first mentioned are most used, and are the most complex, and therefore receive the most attention. The various types of this class are considered, and the stresses for several cases are first determined by the usual method, finding the reactions by the theorem of three moments. It is well known that this only gives a good approximation to the true stresses. Professor A. J. DuBois, in his work, "Maximum Stresses in Framed Structures," gives a method of determining the true stresses by applying the principle of least work, and in our issue of Feb. 4 our correspondent, "C. F. M.," showed how these might be computed by a simple method of deflection. This latter method is here fully and clearly described, and will tend to diminish the prejudice against this class of structures on account of their supposed ambiguity.

The chapter on cantilever bridges is thorough and complete, showing first how to place the live load for maximum stresses and then how to determine the same both analytically and graphically. There is an interesting theoretical discussion of the economic relative lengths of the anchor span, the cantilever arm and the intermediate truss. It is stated that in many cantilever structures the suspended truss has probably been made too short and the cantilever arm too long for the best economic results. A comparison of the economy of cantilevers and simple trusses is made, the amount of material in each being assumed proportional to the area of the moment curves. It is shown that if the piers can be located freely the simple truss is the best, both from economy and stiffness. If, however, there is to be one long middle span with shorter approach spans, the cantilever will probably be the more economical, though its deflections will still be greater. Practical considerations, however, are the chief things to be considered, and the results obtained from theoretical analyses can be only taken as rough guides to assist the judgment of the engineer.

In the chapter on suspension bridges we are shown how to calculate all stresses in all members under all possible conditions. A discussion on inclined stays shows that they are of little value in relieving the stresses in the cable. In the New York and Brooklyn Bridge the stays were designed to carry a portion of the load, but it is shown to be impossible for the assumed portion of the load to come upon them. This theory conforms with modern practice, for we see that in the design of the new East River Bridge by Mr. L. L. Buck they have been left out entirely.

The two forms of stiffening truss, with and without hinges, are considered, and several errors pointed out in the assumptions upon which they have generally been designed. Theory requires the truss with a center hinge to be a little heavier than the one with unbroken chords, but attention is called to the fact that the center hinge has much improved theory and permits a more rational design of the structure. In actual practice, however, many engineers prefer the continuous truss. Mr. Morison, in his "Study on Suspension Bridges," in the Transactions of the American Society of Civil Engineers, December, 1896, chose such a one, and in the discussion of the paper Mr. Lindenthal agrees with him, and states that Professor Melan, of Austria, is likewise of the same opinion.

The author, after having taught us to design a suspension bridge according to modern theories, makes us feel a little dissatisfied with our knowledge by referring to the time "when the true theory of suspension structures is developed." In the meantime it is satisfactory to see the beautiful structures doing their duty, even if they are not based on exact assumptions.

An interesting article is that on limiting and practical spans. That for a cable merely supporting its own weight is from two to three miles long, depending on the sag ratio used. Of course, if the cables carry an aditional load, as in a bridge, the span is much less than this, and it will probably be in the neighborhood of 4,000 ft., depending on the assumed conditions.

Probably the stresses most difficult of calculation to the young engineer, and perhaps to some older ones, are those obtained in arches. Most attention is given to those of the three-hinge type, the actual maximum and minimum stresses being computed for several cases. The theory of these arches is more satisfactory than that of the arch of two hinges or the arch with fixed ends, as in the three-hinge structure the reactions are statically determinate. They are, however, lacking in stiffness, and for railroad traffic one of the other types is usually chosen. It is mentioned, however, that the "most advantageous method of combining arch ribs and spandrel bracing is yet in its infancy," and when this is developed it is possible that the three-hinge arch may be applied to cases where the others are used now.

Throughout the book are given the interesting historical and descriptive notes characteristic of Professor Merriman's text books, and all is treated with his customary clearness.

The Commercial Year Book. A Statistical Annual of the United States and Foreign Countries. Edited by Walter A. Dodsworth, Ph. D. Volume III., 1898. New York: The Journal of Commerce and Commercial Bulletin. Octavo, 620 pages, cloth. Price $1.

It is difficult to give in a few words an accurate notion of the contents of this "Commercial Year Book." The title page says that it is "a statistical annual relating to the commerce, industries, agriculture, banking, currencies, investments, railroads, shipping, insurance, army and navy, population, etc., of the United States and foreign countries," and perhaps we can do no better than to accept that statement. The third volume is about 28 pages larger than the second, and, nevertheless, much of what was in the second has been omitted from the third. Therefore, those who possess the second volume will naturally preserve it by way of making the set of references complete. For instance, from the statistical tables which are continued in Volume III. the earliest years have generally been omitted, and in many instances the tables have been considerably condensed. "Innumerable minor statistical tables have been discontinued and new matter substituted." Although the volume has been increased in size and in variety of contents the price has been reduced from $1.50 to $1.

Part I., being 142 pages, is given up to foreign countries, and gives statistics of their area, population, fiscal affairs, agriculture, industries, commerce, shipping, railroads, telegraphs, banking and money. Part II., the United States, fills 454 pages, and here we find an enormous mass of useful information, much the greatest part of it being compact tables; but a trifling part of the space is occupied by text. The information is made readily available by an index of 22 pages.

The Calorific Power of Fuels. By Herman Poole, Am. Soc. M. E., Am. Soc. C. E., etc. Octavo, 255 pages, 40 engravings. New York: John Wiley & Sons, 1898.

In the preface the author says that he has endeavored to collect into one work all the best information presented at various times regarding the calorific power of fuels, and while the data selected are in the main correct, still it is supposed that some unreliable statements may have crept in. The author evidently underestimates the chances for error in compiling from miscellaneous sources.

The book was begun as a translation of M. Scheurer-Kestner's "Pouvoir Calorifique des Combustibles," but in adapting it to American methods and data, it

was found advisable to simply use the skeleton of that work and fill it in as considered best. Several methods for determining the heat of combustion from the chemical analysis of the fuel are given, together with descriptions of the leading calorimeters, those most commonly used being described more fully than the others and some examples of working and calculation are added. Mahler's calorimeter, which is now considered to offer the most advantages, is treated in considerable detail.

Coal being the principal fuel naturally receives more space than any of the others and most of the examples and calculations are based on results from this fuel. The other fuels are discussed briefly, some space being given to the heats of formation of the different kinds of gas and the advantages gained by their use. A short account of theoretical flame temperature is given, with the methods of calculating and applying the same.

An appendix contains the full report of the committee of the American Society of Mechanical Engineers on the Revision of the Society Code of 1885 relative to a standard method of conducting steam boiler trials, several of the appendices to this report being included. This report was presented at the December meeting of 1897. Tables of constants used in the study of fuels and allied subjects are added, together with fuel tables which contain in many cases the analyses, and in all instances the heat units of many kinds of fuel.

The book shows evidence of care in preparation and as a whole it will be useful to a few investigators in bringing together much scattered data, but to most of those who have to deal with fuels, it will be mainly an elaborate theoretical study.

TRADE CATALOGUES.

The Illinois Steel Co.—This company issues a very pretty pamphlet describing the various works which it owns and controls, and giving many excellent views, from photographs, of the works and machinery. There are five plants which occupy 700 acres of ground. Besides these properties, the company owns coal mines, coke ovens, iron ore properties and limestone quarries. The company also owns a controlling interest in the Chicago, Lake Shore & Eastern Railway, which connects, by means of its own and belt lines, with the railroads terminating in Chicago, and the extensive Calumet docks. The authorized capital of the Illinois Steel Co. is $50,000,000, of which $18,650,635 has been issued. It has 17 blast furnaces, 4 Bessemer steel plants, a large open hearth steel plant, two rail mills, billet mills, twin rod mill, plate mill and merchant mills. The open hearth steel plant at South Chicago was described and illustrated with great fullness in the Railroad Gazette of Sept. 3, 1897. This pamphlet contains an excellent description of the works in general and a brief one of the open hearth plant.

One of the interesting industries of the company is that of making hydraulic cement from blast furnace slag. This is done at the North Works of the company and the product is sold under the name of Steel Portland Cement. The very moderate success which has been reached in selling furnace slag cement in Europe has been, it is said, due mainly to two causes—its irregularity and its slowness in setting. The irregularity comes chiefly from the irregularity of the slags themselves, which are made from very low grade ore. The ore used by the Illinois Steel Co., being "selected from the purest and most regular mines in the world," yields a slag of uniform character. Each lot of slag is submitted to analysis and that which is not suitable for cement is discarded. The difficulty of slow setting is overcome "by patented as well as secret improvements in the process." The present capacity of the cement plant is about 300 barrels a day, but the building of a new plant of greater capacity is likely to be undertaken soon.

Valves, Injectors and Steam Specialties.—The Lunkenheimer Company, Cincinnati, O., issues an 1898 catalogue, showing brass and iron valves, injectors, whistles, lubricators, oil cups, grease cups and various steam specialties. The catalogue is a convenient pamphlet of 208 pages, with illustrations, descriptions and tables of specifications of a great variety of fittings. In the past year important additions have been made to the plant of this concern in the way of new machinery and buildings. Copies of this catalogue can be had on application.

Norfolk & Western Train Rules.

(Continued from page 309.)

and coaling stations under control. Rule 399 fills two pages. Rule 413(b): Conductors of work trains when working between stations must give their flagmen flagging instructions in writing. Rule 414(b): Switching engines will have the right to work within yard limits upon the time of second and third class trains, and also upon the time of delayed first-class trains. Rule 419(a): A freight train must not pass through a station without receiving from the rear the go-ahead signal.

Under Rule 465(a) conductors must always show telegraphic orders to the rear brakeman, and when practicable to the forward brakeman. Enginemen must, in all cases, show them to the fireman and when practicable to the forward brakeman. If a meeting order is sent to a train at the meeting point the fact must be stated in the body of the order for the benefit of the other train. Where it is deemed necessary to send a meeting order to the meeting point for the operator only, his understanding should, if practicable, be received before the order is made complete to either train.

Rules 501 to 542 are to govern the operation of block signals. Enginemen and conductors running under a permissive card must move with great caution, and where the view is obscure must reduce speed to insure against collision with a preceding train. A clear block signal indicates that the section is clear to the first outer switch of the next station ahead. Trains must not meet at a non-telegraph station without special orders, copies of which will be sent to the operators at the nearest block signal stations. In some cases a permissive arm on the signal is used instead of permissive cards. The arm is painted green and placed below the absolute block arm. To give a permissive order to proceed the upper arm is lowered and the lower one is kept in the horizontal position. The responsibility for colliding with trains, when a permissive signal is given, will rest with the train receiving and moving under such signal.

TECHNICAL.

Manufacturing and Business.

The Scherzer Rolling-Lift Bridge Co. has removed its general offices to Suite 1615-16 Monadnock Block, Chicago. This company has recently made an agreement with the Sanitary District of Chicago to design an eight-track, rolling-lift bridge over the Drainage Canal, to be used by the Pittsburgh, Cincinnati, Chicago & St. Louis, the Chicago & Northern Pacific and the Union Stock Yards & Transit Co. As noted in a previous issue, Mr. Scherzer has also taken a contract for making plans and superintending the building of a six-track, rolling-lift bridge composed of three separate, double-track bridges, near the new terminal station at Boston, Mass. Plans for several other large railroad and highway bridges are being prepared.

Mr. O. E. Hovey, Chief Draughtsman, Union Bridge Co., Athens, Pa., sailed from New York for London April 16 in the interests of the company.

The Westinghouse Electric and Manufacturing Company has just opened a new branch office at Austin, Texas. J. E. Johnson will have charge of the office and of the further extension of Westinghouse business in the Southwest. The large contracts which this company has been handling in Mexico and the Texas region have led to the establishment of this new office.

R. W. Hildreth & Co., engineers, have moved their office from 50 Broadway to 32 Broadway, New York. They have also associated with them as consulting engineers Messrs. Joseph Mayer, M. Am. S. C. E., and E. Ludlow Gould. Mr. Mayer is well known as having been for a number of years with the Union Bridge Co., where he has been closely concerned in the design of many great structures.

F. M. Pease (incorporated), Chicago, has sold 5 tank cars to Steinhardt & Co., New Orleans; 1 tank car to A. A. Bushnell & Co., Peoria, and 1 caboose car to the Gila Valley, Globe & Northern.

The Rigby Mfg. Co. of Pittsburgh, has been organized by Rigby Brothers of Wheeling, and P. H. Weaver and E. F. Austin, Pittsburgh, to make a frictionless rod packing patented by C. F. Rigby.

Pawling & Harnischfeger of Milwaukee, Wis., have opened an office in the Fidelity Building, Pittsburgh, with W. C. Beach, Manager, representing them in the crane line.

The American Brake Shoe Co. of Chicago, has been incorporated with a capital stock of $100,000, by Frank H. Drury, Julius N. Raymond and Otto R. Barnett.

The New York office of the Ashton Valve Co. will, on May 1, be moved to 121 Liberty street.

Iron and Steel.

The Edge Moor Iron Co. has received a contract from the Allegheny, Pa., Water Works Department for a 250 H. P. boiler to cost $6,152.

The National Foundry & Pipe Works, Limited, Pittsburgh, have secured a contract from the city of St. Johns, N. B., for 4,000 tons of water pipe.

The employees of the Shelby Tube Co., at Greenville, Pa., have received an unasked advance. The men at the drawing benches received a 10 per cent. advance, those in the annealing, pickling and finishing department 20 per cent., the machinists 10 per cent. and the plier boys 20 per cent.

The American Steel Casting Co., of Thurlow, Pa., is making a large number of anchors for the U. S. Government and for merchant ships being built by the William Cramp & Sons Ship & Engine Building Co.

It is stated that the Pennsylvania Bolt & Nut Co., of Lebanon, Pa., has completed arrangements for building an extension to its plant which will entail an outlay of $50,000.

New Stations and Shops.

The Board of Trade of Mansfield, O., has asked the Pennsylvania Co., the Erie and the Baltimore & Ohio to consider substituting for the present separate stations at that point, a union station to be used by all three companies. No decision has been arrived at.

The Chicago, Milwaukee & St. Paul will build a 5-story brick and stone depot building in Minneapolis, Minn. The building will be 130 x 120 ft., and is estimated to cost $150,000.

The Gulf, Colorado & Santa Fe has let a contract to Evans & Fleshour, of Cleburne, Tex., for the building of a 24-stall roundhouse at Temple, Tex.

New Ships for Old Dominion S. S. Co.

John Roach & Sons, Chester, Pa., have received a contract from the Old Dominion Steamship Co. to build two ships to take the place of the Yorktown, sold to the U. S. Government, and the Roanoke, sold to a line operating on the Pacific Coast. They will be duplicates, practically, of the Princess Anne, built at this shipyard. The length over all will be 324 ft., 304 ft. on the water line, 42 ft. beam and 27 ft. depth of hold. They will have triple expansion engines of 4,000 H. P. The boilers will be 14 ft. 6 in. in diameter, the working steam pressure 190 lbs. to the square inch. There will be three decks and capacity for carrying over 2,000 tons of freight, and berthing room for 120 first-class and 50 second-class passengers.

Electricity on the South Side Elevated, Chicago.

As noted in our issue of last week, the South Side Elevated Railroad, Chicago, started the regular electric trains Wednesday morning, April 20, five days later than the time announced. Twenty-five cars were run during the day, and no delays of consequence occurred because of the change, those trains operated by electric motors being run between trains hauled by locomotives. In all 30 cars have so far been equipped for using the Sprague system of control, and during the past few weeks these have been broken in on the middle track in Sixty-third street, near Cottage grove avenue, and on the main line at night. While starting the electric cars is a simple operation if everything is in working order, the controlling apparatus is so complicated that the new motormen are slow in learning where to look for the cause when accidents occur which render the apparatus inoperative.

Pneumatic Painting.

The government has recently bought Bryce pneumatic paint machines for the purpose of painting war ships at the New York Navy Yard dock. Mr. John A. Chater is now painting under contract with Arbuckle Bros. their new sugar refinery in Brooklyn with the Bryce machines. The work on these buildings is with cold water paint. The buildings are 200 ft. long by 87 ft. wide and 10 stories high, the ceilings varying from 12 to 25 ft. The machine has sprayed 14 ft. ceilings from the floor without any scaffolding. Three hundred thousand feet have been painted, and Arbuckle Bros. are so pleased with the neatness and despatch of this machine that they have given a new contract for a building of equal size. These machines have shown great speed and cleanliness.

The Simplon Tunnel.

The provision of capital for the Simplon Tunnel does not proceed smoothly, in Italy at least. Of the portion of the capital to be provided by Italy a million francs must yet be secured before the work can be safely begun. The central government cannot undertake to assume the entire burden of this, but will make up the deficit if Milan, Genoa and other cities and provinces will collect "some hundreds of thousands."

Electric Motors in Bicycle Works.

The works of the Miami Cycle & Mfg. Co., at Middletown, O., are run by electric current brought from the station of the Middletown Electric Light & Power Co., one mile distant. The current is delivered at 1,000 volts and reduced at the shops to 115 volts. In the machine and tool room are three lines of shafting, each 210 ft. long and each driven by a 20 H. P. motor. In this room are 84 machines. In the drill room there are 26 machines driven by a 10 H. P. motor, and another 10 H. P. motor drives all the machinery in the frame department. The polishing room requires two 30 H. P. motors, which drive two lines of shafting, each 93 ft. long. Another 30 H. P. motor drives a fan which carries away the dust from the polishers. In the plating room is a 5 H. P. motor to supply the plating dynamos and another 5 H. P. motor is installed in the assembly room to run a number of small machines and an elevator. The alternating current is used, the system being such that the motors and the lamps can be run from the same circuit.

General Electric Company.

The sixth annual report of the General Electric Company for the year ending Jan. 31, 1898, was published on Tuesday of this week. The report of the First Vice-President, Captain Griffin, gives:

Sales (as billed to customers)	$12,396,093
Cost, taxes, etc	10,896,578
Profit on sales	$1,499,515

There were other gross earnings, making the total

gross about $12,525,000, and after adding to the net profit of manufacture certain profits on interest, etc., there is a net revenue of $1,853,702. The chief items deducted from this are about $79,000 for sundry losses, $333,335 for patents and patent expenses, nearly $90,000 under the head of inventories and consignments and an item of $250,000 reserved for extensions to the factory plants. The total of these deductions is $621,849, leaving "reduction of the deficit of previous years" $1,231,852. Debentures to the amount of $2,000,000 had been purchased before, and in the year now reported on another two millions had been purchased, the entire $4,000,000 having been destroyed. It is estimated that the new foundry and machine shop, which we have already described, will require about $500,000, one-half of which has been written off this year.

The question of reducing the capital stock of the company has had the serious attention of the directors, and it is hoped that a plan will soon be submitted for the consideration of the stockholders under which the share capital will be reduced to the dividend point.

With regard to the recent decision on the Van Depoele patent, the opinion is expressed that "upon full consideration at the final hearing the technical objections to the claims of the patent will be insufficient to defeat the patent." Nevertheless, "In view of the fact that nearly all of the railway companies in the country that would be likely to use the overhead trolley system are now electrically equipped, and that the third rail and underground conduit methods are being rapidly adopted for the important new enterprises, an adverse decision in this case will have but slight effect upon the business of your company."

The common stock of the company is now $30,460,000, and the preferred stock, $4,252,000. The 5 per cent. gold coupon debentures amount to six millions. Accrued interest and accounts payable foot up $313,526, making the total liabilities a little over $41,000,000.

Technical Prizes of the German Railroad Union.

The German Railroad Union has every four years offered prizes for important inventions and improvements in railroad construction and machinery and railroad management. This spring it announces a first prize of $1,800, a second prize of $720, and a third prize of $360 for inventions and improvements in construction and mechanical apparatus; equal prizes for inventions and improvements affecting rolling stock and its maintenance; and a first prize of $720 and two prizes of $360 each for improvements in administration and operation. Without excluding other things, the Union suggests as matters in which improvement is desired:

Improvements in the construction of locomotive boilers, especially such as, without increasing weight materially, secure economy in fuel, the prevention of sparks, the most complete consumption of smoke possible, and the reduction of cost of maintenance.

An arrangement by which the coupling of cars with automatic American couplers and those with the standard couplers of the times may be made without danger.

Weighing apparatus, by which separate cars while moving, or loosely coupled cars of a whole train may be weighed with sufficient accuracy.

Some means of protecting a train which has come to a stop or is threatened with delays which in bad weather and at night will work better than the track torpedoes and the hand signals of track and train men.

Those inventions or publications alone may compete which have been made or published between July 16, 1891, and July 15, 1899. The invention or method must be already introduced on some railroad in the Railroad Union before application is made to compete, and its application must be supported by the railroad trying it. Notice of competition must be sent in to the executive of the Union between Jan. 1 and July 15, 1899.

Steel Sleepers on the Gothard Railroad.

From an article in the (London) "Railway Engineer" by Mr. J. W. Post, of the Netherland State Railroad, it appears that the Gothard Railroad Company of Switzerland now has 70 per cent. of its main track laid with iron or steel sleepers. Including side tracks, the company has 440,000 metal sleepers, which is equal to nearly two-thirds of the whole. This company began using metallic sleepers 16 years ago, and has carefully watched the records of those put in. The road is crooked and has long tunnels and steep grades. The average weight of metal sleepers now being laid is 163 lbs., which is the result of a gradual increase from an average of 120 lbs. in 1887. The ties are now made 8 ft. 10 in. long, which is one foot longer than was customary at the beginning. The cost of a new mild steel sleeper of 163 lbs., with fastenings, is $1.98, but in renewals this cost is diminished by the value of old material, so that eventually the net cost will be a little less than that of oak sleepers, which, for the same length, cost $1.68 each, including plates and spikes. After the first two years the cost of keeping the track in order is decidedly lower with metal than with wooden sleepers, and the lateral displacement of the track on curves is less. The lighter sleepers formerly used developed some failures on account of cracks in the corners of the punched bolt-holes, but there has been no trouble with the later designs. (Mr. Post notes that metal sleepers with drilled holes, used in Holland, show no trace of fissures.) In long tunnels the steel sleepers rust, so that they last only about 8 or 10 years, and on tangents in long tunnels wooden sleepers are still used.

Even if steel sleepers were not more economical than wooden, the Gothard Company would deem it necessary to use them on account of safety, at least on curves. Mr. Post expects that, except in tunnels, steel sleepers will last as long as the rails, and he mentions 10,000 iron sleepers now in the track of the Netherland State Railroad which were laid in 1865, and which, though of a type now considered poor, are in such good condition that the oak blocks between the sleeper and the rail are being replaced by cast-iron blocks.

Car Building in Germany.

From the report of two great car building establishments in Cologne, it appears that, in spite of the great increase in traffic on the railroads and the large orders for new cars, that business is likely to be overdone in Germany. They report that while the Prussian State Railroads have given orders for 510 passenger cars and 15,000 freight cars to be delivered during the current year, the capacity of the works is for about 2,000 cars monthly; and though there are considerable orders for street cars, etc., the capacity must exceed the demand by some thousands. More than that, ten or twelve new car-building works are under way, threatening to repeat the experience shortly after the French war, when there were no less than 42 car-building works in the German Empire, of which only 21 survived till 1880. Probably the Cologne works have painted the prospect in dark colors, not wishing to encourage the establishment of competitors; but one need not go to Germany to learn that the business of car-building can easily be overdone.

Public Works in Chicago.

The Board of Local Improvements of Chicago has announced that about $2,000,000 will be spent in street and sidewalk improvements this year under the special assessment law. After an inspection of the streets by the Board it was decided that ordinances should be drafted at once and that the work of laying good, permanent street pavements of granite, asphalt, macadam and brick will be done this summer.

The bids for the new fire tug for Chicago, which was mentioned in our issue of Feb. 4, were all rejected at Chicago last week, none of them being within the amount ($70,000) appropriated by the council for the boat. Modified specifications will now be prepared and new bids asked for.

THE SCRAP HEAP.

Notes.

Brown's discipline has been adopted on the Mexican Central.

The Fitchburg road will hereafter run its day express trains, Nos. 1 and 8, through between Boston and Albany.

On Sunday, April 24, a special train of the Erie road, carrying newspapers, ran from Jersey City, N. J., to Cleveland, O., 627 miles, in 13 hours and 24 minutes, equal to 46.8 miles an hour. The train made 16 stops.

Passenger train No. 1 of the Santa Fe Pacific was stopped by robbers at 2 o'clock on the morning of April 20, near Oro Grande, Cal., and Engineman Gifford was killed by a shot fired by one of the robbers, though not until after he had fatally wounded a robber. The robbers got no valuables, except the registered mail. They were caught by the sheriff two days afterward.

The Postal Telegraph Co., operating the wires along the lines of the Chicago Great Western, is putting in seven dynamos at Oelwein, Ia., to furnish electric current for all of its telegraph lines centering at that point. About 600 cells of battery will be displaced. A 220-volt dynamo will be run by a direct connected engine, and there will be six other dynamos. It is expected that the cost of maintenance will be only about one-quarter that of the batteries hitherto used.

End of a State Railroad Experiment.

Not before it is time, the Argentine Government has determined to go out of the railway business altogether. It is stated that the Finance Minister has proposed to the Cabinet the leasing of all the railway lines belonging to the nation, as a measure of economy which would relieve the Administration account of a large deficit which those railways show. The measure is based upon the assertion that private enterprise would not give such unfavorable results as are shown by some of the lines managed by Government, and others, like the Central Northern and Andine, would yield a larger return than that now produced. If the National Railway Board went the way of all flesh, too, the loss would not be irreparable.—Herapath's Journal.

The Congo Railroad.

According to the London Times, the Congo Railroad, from Matadi to Stanley Pool, will be finished and open for traffic by May 1, and it is intended to have an official ceremonial opening on July 1, under the direction of the new Governor-General of the Congo State, Major Van Gele. The Congo Railroad has been five years in building. It connects the navigable waters of the Lower Congo at Matadi with the Upper Congo at Ndodo on Stanley Pool, a short distance east of Leopoldville. It is about 260 miles long, and all but about 19 miles of this distance is already finished. For about 18 miles near the lower end there was much rock cutting and the line runs through several tunnels. The rest of the way the engineers have sought to avoid, rather than to overcome natural obstacles and the line is quite crooked. There are eight bridges from 150 ft. to 180 ft. long and two that are much longer.

The Government is already considering the construction of other railroads, and it is said that a line connecting the Lubefu River with the Lomami will probably be begun this year. The two rivers named flow into the Congo and the proposed railroad is to connect them near the head of navigation.

Work on the Federal Building, Chicago.

The pile driving for the foundations is about four-fifths done, but the work of laying the masonry foundations has been delayed during the last two months by lack of dimension stone, of which the supply on hand last fall was not sufficient. The Committee of Arrangements for laying the corner-stone in October next met April 14 at the Union League Club, and the selection of Mr. Charles U. Gordon for permanent chairman recently made by Secretary Gage was unanimously approved. Postmaster Gordon presided at the meeting, and W. P. Williams was elected Secretary. The date for the ceremony has not been decided upon, although Oct. 8 is the favorite.

The Bogota & Girardot Railroad in Colombia.

A modification has been made of the concession of 1894 for this road, whereby the Government extends for five years from Jan. 5, 1898, the time for building the road, and the concessionary binds himself to deliver it finished at that time. The conditions are that it shall be one meter (39.37 ins.) gage and the rails 20 kilograms (44 lbs.) to the meter. The locomotives are to weigh not less than 30 tons each. The completed line is to run from the Savannah of Bogota to the Port of Girardot, and the first 10 km. (6.2 miles), from Juntas de Apulo toward Bogota, must be completed within one year from Jan. 5. A deposit of $50,000 in gold is made by the concessionary as a guaranty for the fulfillment of the contract.

Massachusetts Institute of Technology.

The collection of physical apparatus has recently received a number of important additions. Among these is a large automatic mechanical air-pump made by Ritchie. Many new vacuum tubes have been procured, and additions made during the past year have rendered the collection of vacuum tubes of all kinds exceptionally complete, probably the most so of any in the country. The automatic mercury pump used in exhausting such tubes as are made at home is a very convenient form designed by Messrs. Norton and Lawrence, instructors in the Institute, a description of which is soon to be published. A new quadrant electrometer of unique construction has also been received from Germany. For the Laboratory of Heat Measurements there has been purchased a Junker calorimeter for the determination of the heating value of gas. This is the newest and best device for this work, and makes it possible to determine the efficiency of gas for heating by means of stoves, or its value as a fuel for gas engines. An extended investigation of the efficiency of non-conducting material used as a protection for steam pipes and boilers has been carried on in this laboratory by Mr. C. L. Norton for the last two years, and is nearing completion. This investigation, made at the suggestion of Mr. Edward Atkinson, is carried on by an entirely new method, the heat lost from a pipe being measured electrically. Greater accuracy than was possible by the older process is assured by this method. The testing of cold storage insulation is being carried on in the same manner.

American Locomotives in Japan.

Consul Lyon writes from Hiogo, March 19, 1898: "The Kobe Chronicle, an English journal published at this port, under date of the 15th instant, copied from a vernacular newspaper the statement that the authorities of the locomotive department at Thimbashi station (Tokyo) are of opinion that American locomotives are superior in all respects to those made in England, and work more economically."

Street Railroads of New Jersey.

The annual returns of cable, electric and horse railroad companies in New Jersey made to the State Board of Assessors for the year ending Dec. 31, 1897, show 65 separate corporations with 622.138 miles of track (not of line), and a total capital of $43,447,550, of which $41,403,248 is paid up. Ten companies do not report length of road, as none had been built, and the track mileage of 13 others is included in the report of some lessee company. The funded and other debt of the companies amounts to $42,547,217, of which $37,815,493 is funded debt. The cost of building the roads, including equipment and appurtenances, was $81,994,579.

The gross receipts for the year were $6,042,307; expenses, $3,746,106; amount paid in dividends, $141,612.

Railroad Cabs in Chicago.

The Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern railroads have arranged with the Owen H. Fay Livery Co., Chicago, for a cab service to and from the Van Buren Street Station, the object being to provide an efficient service and to maintain moderate rates in accordance with the city ordinance. As noted in our issue of March 25, this Livery Co. has contracted for 50 cabs to be driven by storage batteries and when finished a number of these will run to and from this station.

Decrease in Exports of Rails from England.

Exports of railroad iron have dropped over 27 per cent., due to a falling off in exports to Spain, Egypt, Japan, Mexico, Peru, Brazil, East Indies and Australia. There is a large increase recorded to Argentine. While referring to railroad iron, we may mention that the Americans have taken an order for 14,000 tons of rails for the Victoria Government. Several of our large steel firms put in tenders for the contract, but we understand the actual difference in prices was about 5s. per ton, of course the Americans being the lowest tenderers. We asked the secretary of one of our large steel companies who tendered for this contract how it was that the Americans beat us,

and the reply was "low royalties, low railroad rates, and no repressive legislation to fight against," and he was also of the opinion that, unless we get relief in these several directions, the iron trade, in spite of its present comparative prosperity, will be in jeopardy. We are further informed that the price quoted by some of the English firms was really below cost, the difference being made up in freights, insurances and other charges.—Iron Trade Circular (Birmingham, Eng.).

In reference to the above the Journal of Commerce (New York) says: "Information has just been received saying that the Government of Victoria has accepted the proposition of an American company to supply 14,000 tons of steel rails and fishplates for £75,471. The two other propositions rejected were both from English firms, at prices respectively of £79,274 and £81,256. Formerly this contract with the Railroad Department of Victoria was held by the Moss Bay and Barrow Steel companies of England, at a rate of £5 13s. a ton, but the Pennsylvania Steel Co. of the United States has successfully carried the contract at a rate per ton of under £5."

The Burlington's Number One.

On May 1 the Chicago, Burlington & Quincy's fast train, No. 1, between Chicago and Denver, will be entirely new. There will be Pullman sleeping cars, Pullman composite cars with smoking and bath rooms and barber shop; reclining chair cars, standard coaches and Burlington Route dining cars, serving meals by the card. These trains will be equipped with all modern conveniences and will have wide vestibules between the cars. All the cars will be lighted with Pintsch gas.

American and Spanish Ships Liable to Capture.

The Journal of Commerce (New York) has published a list of American and Spanish merchant ships which are in the way to be captured in case the cruisers of the respective countries happen to run across them. The latest known position of each ship is given in the list, which ought to be morally valuable information for the captains of the warships. This list includes 12 American steamers and 183 American sailing boats. The Spanish list includes 42 steamers and 22 sailing ships.

New York Electrical Exhibition.

The electrical exhibition which is to be opened to the public on the evening of Monday next at Madison Square Garden, New York, and continued through the month of May, will be much larger and probably excite greater interest than any previously held. More than 130 exhibitors have been granted space in the building and special effort has been made to include among the exhibits working models of inventions that have attracted the public attention during the past year or two. During the month of May a number of electrical societies in New York, Pennsylvania and New Jersey will hold their meetings at the exhibition hall, thus bringing together a large number of electrical engineers and those interested in electrical industries

A few of the more interesting exhibits might be mentioned: Mr. H. J. Smith of Pompton, N. J., will show a model illustrating the manner of protecting harbors by submarine explosives and mines. A very complete working model of the third rail apparatus, as used on the New York, New Haven & Hartford Railroad, will be shown with trains in actual operation, the model resembling as closely as possible the portions of road now in operation which are worked by electricity. Chief McCullagh, who is at the head of the police force of New York, will show the proposed method for establishing complete communication in the police department throughout the city. As far as possible, the method of communication will be shown in operation. The city recently made an appropriation to help carry out this system. Another interesting feature will be a telegraphic tournament under the direction of Mr. Fred Catlin, which will be open to all experts who desire to compete for the prizes to be offered for speed in sending messages. A model of Edison's magnetic ore separating apparatus will also be shown.

The exhibition will also have an educational aspect. Prizes to the value of not less than $100 each have been offered to the pupils of the public and private schools in New York and vicinity for essays on the exhibition. The committee is composed of Prof. F. P. Crocker, Mr. G. H. Guy and Mr. T. C. Martin. The object of this is to encourage the scholars in the schools to visit the exhibition for something besides merely idle curiosity, but rather to secure accurate knowledge of the progress of electrical industries.

Mr. Marcus Nathan is President of the exhibition.

The Railroad Tricycle in Australia.

There is considerable danger in the use of railway tricycles, and several fatal accidents have been recorded in this colony. The danger arises from trains coming up from behind and overtaking the tricyclist. In order to prevent accidents the regulations are very strict, and if obeyed fatalities would be rare. Only certain persons are allowed to use the tricycles, and it is provided that gangers on double-line sections must travel on the line on which they would meet the trains. The men are also required to make themselves acquainted with the running of the trains. Tricycles are never to be used at night except when absolutely necessary, and then red lights must be displayed. As an additional safeguard the Railway Commissioners some time ago arranged for mirrors to be placed on the tricycles in such a position as to enable the riders to see trains coming up from behind. These mirrors are now in general use, and have been found serviceable. —Sydney Morning Herald.

The Germans in China.

Mr. John Fowler, U. S. Consul at Chefoo, writes: "I inclose an extract from the Shanghai Gazette, giving what purports to be details of concessions granted to Germany for building the railway from Tsingtao (Kyao Chao) to the capital (Chinan-fu), and for controlling the mineral field along the route. I need only say that if the statements contained in this extract prove true, we will be debarred from entering into what is really the flower of Shantung. Its effect upon our commerce, which is now increasing by leaps and bounds, will be disastrous:"

The Chinese Government has consented to the Germans constructing a railway through Shantung on the following conditions: The line to run first from Kyao Chao to Chinan-fu. Only German and Chinese subjects to be permitted to hold shares in the railway. Mining rights to be granted to the railway company to work mineral deposits for 3 miles on each side of the railway. Only German engineers to be employed on the railway and in opening up the mines. Chinese vessels, both men-of-war and trading, are to be permitted to have the free use of Kyao Chao harbor.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works have received an order to build one American type passenger engine for the Norfolk, Virginia Beach & Southern.

The locomotives for the Elgin, Joliet & Eastern, referred to in our last issue, will be ordered through the office of the President in New York City.

The Southern Indiana has placed an order with the Baldwin Locomotive Works for three more 10-wheel engines to be duplicates of those referred to in our issue of Dec. 17 last.

H. K. Porter & Co. have recently shipped to St. Petersburg, Russia, two locomotives for a 29½ in. gage suburban road running out of St. Petersburg. They will have 9 in. x 14 in. cylinders, six driving wheels 27 in. diameter side tanks and sheet steel canopy, and will weigh about 27,000 lbs. each in working order.

The 12 consolidation locomotives ordered by the Southern and referred to in our last issue will be duplicates of those illustrated and described in our issue of March 4, and will be equipped with Westinghouse brakes, Ross-Mehan brake shoes, Janney couplers, Southern standard 18 in. headlights, U. S. Metallic piston and valve rod packings, Coale muffled safety valves, Leach sanding devices, Nathan lubricators, Crosby steam gages and Latrobe tires.

CAR BUILDING.

The Fitchburg contemplates building 15 or 20 new passenger cars at its shops.

The Minneapolis, St. Paul & Saulte Ste. Marie is asking bids on 500 standard box cars.

The Mexican Railroad has placed an order with the St. Charles Car Co. for 50 freight cars.

The Michigan-Peninsular Car Co. is building 65 cars for the Oliver & Snyder Steel Co.

The St. Charles Car Co. is building one car for passenger service for the St. Louis, Chicago & St. Paul.

The Detroit & Mackinac will order the 150 freight cars referred to in our last issue within about 30 days.

The Western Railway of Alabama is having 100 freight cars built at the works of the St. Charles Car Co.

The Peoria & Hutchinson Cooperage Co. has recently placed an order with the Wells & French Co. for 20 cars.

The Interoceanic has placed an order with the St. Charles Car Co. for 50 box cars to be 34 ft. long, 25 to have Chicago and 25 Cleveland roofs, and for 25 stock cars of the same length with double board roofs.

The Kings County Elevated of Brooklyn has placed an order with the Wason Car Mfg. Co. of Springfield, Mass., for 41 passenger cars, 20 of which will be equipped with electric motors for use on the Brooklyn Bridge.

BRIDGE BUILDING.

BELLE VERNON, PA.—The Pittsburg & Lake Erie will build five steel bridges. (Railroad Construction column.)

BELLEVILLE, ILL.—St. Clair County will build an iron bridge across the Kaskaskia River at Cox's Ferry.

BRADFORD, PA.—The Mayor has reported the bridge at Forman street as dangerous, and suggests a new structure.

CHICAGO, ILL.—The Sanitary District, Chicago, is preparing to ask for bids on the construction of the channel through Joliet, Ill. It will also shortly ask for bids on the Campbell avenue bridge at the crossing of the Pittsburg, Cincinnati, Chicago & St. Louis, Union Stock Yards & Transit Co. and Chicago & Northern Pacific tracks. The status of the eight-track bridge matter was given in our issue of April 8, page 262.

COLFAX, WASH.—The Commissioners of Whitman County will build a new bridge at Tekoa. John Tobin, County Auditor.

CONWAY, MASS.—The Berlin Iron Bridge Co. of East Berlin, Conn., has just completed for the Conway Electric Street Railway Co. a steel bridge to carry its track across the Deerfield River. This bridge is about 300 ft. in length.

EATON, O.—Press reports state that the Commissioners of Preble County will build a bridge at New Paris to replace one recently carried away by floods.

ELBERTON, GA.—The Board of Trade are endeavoring to have a bridge built across Broad River.

ENGLISH, KY.—An iron bridge, to cost $2,000, will be built at English.

LAKE BELT, MINN.—A new bridge will be built across Ten Mile Creek by the town of Lake Belt.

MONTREAL, QUE.—The proposed bridge over the canal will be 217 ft. in length and 44 ft. in width, and will cost $85,000. It will have two tracks for electric cars, a double road for vehicles, and space for foot passengers. Two electric motors of 50 H. P. will supply the power.

NEWARK, N. J.—Mr. James Owen, Engineer of Essex County, in his report on the crossing at Bloomfield Ave., Verona, made to the Board of Freeholders' Committee on Roads and Assessments, recommends that a bridge be built over the tracks of the Erie Railroad, the estimated cost ranging from $25,500 to $33,000.

NORRISTOWN, PA.—The Commissioners of Montgomery County will build five new bridges, locations in Norristown, Pottstown, Yerkes, Salford and Upper Salford. Edward M. Ritchie, County Surveyor.

OTTAWA, ONT.—The city will build a steel bridge over Paterson's Creek at Elgin street.

PAOLI, IND. — The Commissioners of Orange County will probably build a bridge at Fisher Ford.

RICHMOND, IND.—A new bridge will be built by the city at North 10th St. at a cost of $6,000. H. W. Weber, City Engineer.

SAGINAW, MICH.—It is understood that several bridges will be required on the line of the Saginaw Suburban Railway Co., an electric railroad now building. A. H. Swarthout, Secretary, 125 North Washington avenue, Saginaw, E. S.

SYRACUSE, N. Y.—The Governor has signed Mr. Delaney's bill authorizing the city of Syracuse to build a bridge over Onondaga Creek at West Water street.

TOLEDO, O.—The Toledo & Monroe Railway Co., now building, will require 2,000 ft. of trestle work. (Electric Railroad Construction column.)

TOWSON, MD.—The Commissioners of Baltimore County will probably build a new bridge, costing $2,500, at Massamore's Mills. M. F. Conner, Clerk.

WAUKEGAN, ILL.—Reports state that the Bluff City Electric Railway Co. has made a contract for a steel viaduct costing $15,000 to cross the tracks of Chicago & Northwestern.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Cincinnati, Hamilton & Dayton.—Preferred quarterly, 1¼ per cent., payable May 9.

Lake Erie & Western.—Preferred quarterly, 1¼ per cent., payable May 16.

Rome, Watertown & Ogdensburg (N. Y. C. & H. R.) —1¼ per cent., payable May 16.

Columbus (O) St.—Quarterly, 1 per cent., payable May 2.

Dry Dock, E. Broadway & Battery (N. Y.).—Quarterly, 1½ per cent., payable May 2.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month at 8 p. m.

Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7.30 p. m.

Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

Chicago Electrical Association.—Meets at Room 7,137, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, secretary.

Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.

Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 7.30 p. m.

Engineers' Club of Columbus (O.).—Meets at 12½ North High street on the first and third Saturdays from September to June.

Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of Philadelphia.—Meets at the house of the club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.

Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7.30 p. m.

Locomotive Foreman's Club.—Meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

Master Car Builders' Association.—Saratoga Springs, N. Y., Wednesday, June 15.

Master Mechanics' Association.—Saratoga Springs, N. Y., Monday, June 20.

Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7.30 p. m.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.

New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m.

Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

Railway Club Secretaries.—Congress Hall, Saratoga, N. Y., June 8, 11 o'clock a. m. H. H. Roberts (St. Louis Railway Club), Secretary.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.

Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month at 8 p. m.

Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1,533 Marquette Building, Chicago, is secretary.

Western Railway Club.—Meets in Chicago on the third Tuesday of each month at 2 p. m.

Western Society of Engineers.—Meets in its rooms on the first Wednesday of each month at 8 p. m., to hear reports and for the reading and discussion of papers. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

Saratoga Conventions.

The Hotel American-Adelphi, Saratago Springs, N. Y., George A. Farnham, Proprietor, has decided to open for the Master Car Builders' and Master Mechanics' conventions. A special rate of $2.50 a day and upward has been made.

Engineers' Club of St. Louis.

The 471st meeting was held April 20, President Bryan in the chair. Thirty-three members and ten visitors were present.

The paper of the evening by Mr. Fred E.Bausch was entitled "A Modern Telephone Plant." The paper gave a brief summary of the recent progress in telephony and gave a description of the standard apparatus in use. A discussion was entered into of the modern telephone line with the advantage of copper wire over iron wire, the effect of capacity on the line, the advantages of cables and the requisites for underground cables. The paper closed with a description of the recent underground conduits installed by the Bell Telephone Co. in the City of St. Louis and the large switchboard built by the same company. A large number of lantern slides illustrating the paper were shown. The discussion which followed was participated in by Messrs. Bryan, Kinealy, Humphrey, Harrington and Crosby.

National Convention of Railroad Commissioners.

The tenth annual convention of Railroad Commissioners will be held at the office of the Interstate Commerce Commission, No. 1317 F street Northwest, Washington, D. C., on Tuesday, May 10, at 11 a. m. The Railroad Commissioners of all States, and State officers charged with any duty in the supervision of railroads are invited, and the Association of American Railway Accounting Officers is also invited to send delegates.

At the last convention, committees were appointed to report on the following subjects: 1. Classification of Construction Expenses. 2. Classification of Operating and Construction Expenses of Electric Railways. 3. Railway Statistics. 4. Uniform Classification. 5. Powers, Duties and Work of Railroad Commissions. 6. Legislation. 7. Delays Attendant Upon Enforcing Orders of Railroad Commissioners. 8. Safety Appliances.

Members of the convention are requested to suggest other topics to the Committee on Programme, of which Hon. James W. Latta, Harrisburg, Pa., is chairman. Addresses will be delivered by M. E. Ingalls, President of the Cleveland, Cincinnati, Chicago & St. Louis, and E. E. Clark, Chief of the Order of Railway Conductors.

Western Society of Engineers.

A special meeting of the Western Society of Engineers was held Wednesday evening, April 20, in the Society Rooms, Monadnock Block, Chicago. Prof. D. C. Jackson and Messrs. H. M. Brinckerhoff and G. P. Nichols composed a committee to arrange for a topical discussion of the subject, "Electric, Pneumatic and Mechanical Power Transmission in Manufacturing Establishments."

The discussion was opened by Prof. Jackson, who stated in general terms the value of electric transmission in shops. Mr. E. B. Clark, Electrical Engineer of the Illinois Steel Co., described the uses of electricity in rolling mills and presented a number of stereopticon views showing various applications of electricity at the South Works of the Illinois Steel Co.

Mr. H. M. Brinckerhoff, Electrical Engineer of the Metropolitan West Side Elevated, discussed the application of electricity to elevated railroads and street railroads. Mr. M. Coster of the Westinghouse Electric Co. spoke of the uses for electricity in and about large manufacturing plants.

Mr. J. F. Lewis of the Rand Drill Co. read an excellent paper, in which the latest uses for compressed air were treated, among which were the transmission of mail through pneumatic tubes and the possible field for "liquid air." Mr. C. W. Melcher of the Ingersoll-Sergeant Drill Co. gave an interesting talk on compressed air plants, illustrated by stereopticon views. The results of some tests to determine the efficiency of certain belt transmissions in a Chicago plant were given by Mr. H. T. Westover, and it was stated that since the tests were made an electric transmission had replaced the belts. A general discussion followed, during which Mr. T. T. Johnston stated that electricity was used for driving the machinery in several large flouring mills in Seattle, Wash.

The Western Society rooms, which are now 48 ft. long by 23 ft. wide, are to be enlarged so as to occupy a space 72 ft. by 23 ft.

The next meeting will be held Wednesday evening, May 4, at which time two papers will be read, one by Mr. T. W. Snow of the U. S. Wind Engine & Pump Co., entitled "Locomotive Water Supply," and one by Mr. Charles E. Billin, Bement, Miles & Co., on "The Cycloidal Pump."

Western Railway Club.

As announced, the Western Railway Club on Tuesday, April 19, visited La Fayette, Ind., leaving Chicago at 9:30 a. m. by a special train over the Chicago, Indianapolis & Louisville. There were about 200 persons in the party. One of the new eight-wheel passenger engines built by the Brooks Locomotive Works, No. 111, was used for hauling the train, which engine was fully described in the Railroad Gazette of July 30 last.

At La Fayette the Monon shops were visited, the train being backed into the shop yards. Here the party was received by Messrs. H. Watkeys, Master Mechanic; W. H. Coburn, Assistant Master Mechanic, and Charles Collier, Master Car Builder, and an hour was spent at this point. The principal features of these shops, which were built in 1895, were given in our issue of August 6, 1897, page 550.

The engineering laboratories at Purdue were next visited, where the club was met by President James H. Smart, Prof. W. F. M. Goss and others of the faculty. The greater part of the machinery and apparatus was exhibited while running or while being used for tests, so that it could be seen to the best advantage.

The drawing rooms, instrument room of the civil engineering students, wood-working room, foundry, forge room and machine room were in use and open to inspection. In the general laboratory the following apparatus was exhibited under working conditions: Triple-expansion Corliss engine; engines of a Baldwin compound locomotive; hydraulic stand pipe, tank and steam pumps; locomotive injector testing apparatus; Westinghouse and New York air pumps; DeLaval steam turbine; three testing machines, ranging from 1,000 to 3,000 lbs. capacity; transmitting dynamometers and various forms of friction dynamometers; Buckeye engine, fitted with long and short indicator pipes; apparatus for determining the atmospheric resistance of trains; Otto gas engine. The electrical laboratory, which is very fully equipped, was also shown under working conditions.

Probably the most interesting place for the members was the locomotive laboratory, where the engine "Schenectady No. 2" was run until 4:30 under such conditions as were desired by the visitors. A regular test was then commenced with a boiler pressure of 200 lbs. per sq. in., throttle wide open and the load such as to hold the speed at 40 miles per hour. Other parts of the institution were visited, but naturally the greatest interest was manifested in the mechanical and electrical work.

A 2,000,000-gal. pumping engine is now being installed in the general laboratory and a new building erected for a railroad laboratory, which, when completed, will contain the M. C. B. brake shoe testing machine and other testing apparatus.

The train on the return left La Fayette at 6 p. m. and arrived in Chicago at 3:15. A description of the trip will be published in the April Proceedings of the Western Railway Club, together with a paper on train resistance by Prof. Goss.

PERSONAL.

—Mr. J. M. Duncan, Southern Freight Agent of the Cleveland, Cincinnati, Chicago & St. Louis at Atlanta, Ga., died at that place April 23, after a month's illness of typhoid fever. He was formerly at Chicago, and was transferred to Atlanta about six months ago.

—Mr. E. F. Farrington, a Civil Engineer of Brooklyn, N. Y., died at Cincinnati, O., at the age of 76, from injuries received recently by being knocked down by an electric car in Cincinnati. Mr. Farrington was Assistant Engineer of the Covington and Cincinnati Suspension Bridge, over the Ohio River, which was described in our issue for Sept. 7, 1897 (p. 644). He was employed on the bridge when it was built in 1868.

—Mr. Angus Smith, one of the founders of the Milwaukee & Northern, now a part of the Chicago, Milwaukee & St. Paul, died at his residence in Milwaukee, Wis., April 22, at the age of 76. He was a Director and Vice-President of the Milwaukee & Northern from 1871 to 1875, when that road was leased to the Wisconsin Central. The Wisconsin Central having defaulted on its lease, the lease was terminated, and the road later became a part of the C., M. & St. P.

—Mr. Elbridge G. Allen, General Superintendent of the Old Colony system of the N. Y., N. H. & H., with office in Boston, Mass., has resigned. He has been succeeded by W. E. Chamberlain, heretofore Assistant Superintendent of the New York Division, with headquarters at Harlem River, N. Y. Mr. Allen was appointed Superintendent of the New York, New Haven & Hartford in 1887, and was Superintendent of the Hudson Division of the New York Central & Hudson River in the latter part of 1890. He was appointed Superintendent of the Central Division of the Old Colony in 1891, and remained as such until March, 1893, when he was appointed General Superintendent of the Old Colony, which was then leased to the N. Y., N. H. & H. R. R.

—Mr. William G. Creamer died on April 22 at his home in Brooklyn, N. Y., at the age of 77 years. A generation ago Mr. Creamer was well known to railroad men of the United States. He had invented a train brake which had some of the elements of a continuous brake. It was actuated by a spring wound up by hand on each car, and in the emergency the engine runner could apply the brakes throughout the train by pulling a cord and releasing the springs. This brake was used on a good many passenger cars throughout the country for several years, but the most ignorant railroad man to-day will see how very far short it fell of answering the requirements of an efficient continuous brake. The success of an emergency application depended upon the faithfulness of several brakemen on each train, involving a certainty of frequent failures. Its historic failure at New Hamburg in 1871, when 21 persons lost their lives and a large number of others were injured, ended its use. Many years of Mr. Creamer's life were devoted to the propagation of theories of ventilation, which were not entirely unsuccessful, as applied to buildings, but which were entirely impracticable for passenger cars.

—Mr. W. H. Newman, Second Vice-President of the Great Northern, has been chosen President of the Lake Shore & Michigan Southern, succeeding Mr. Samuel R. Callaway, who has been made President of the New York Central & Hudson River. Mr. Newman was born in Virginia in 1847 and began railroad service in 1869 with the Texas & Pacific at Shreveport, La. In 1873 he was made General Freight Agent of that road and remained as such for ten years, until June, 1883, when he became General Traffic Manager of the Gould Southwestern lines in Texas and Louisiana, composed of the Texas & Pacific, International & Great Northern, Galveston, Houston & Henderson and the Missouri, Kansas & Texas. He held this office a little over two years, until December, 1885, when he was appointed Traffic Manager of the Missouri Pacific system, which office he held until August, 1887, when he became Third Vice-President. Mr. Newman remained as Third Vice-President of the Missouri Pacific until June, 1889; was made Third Vice-President and Traffic Manager of the Chicago & Northwestern in November, 1889, and became Second Vice-President of the Great Northern in September, 1896, succeeding Mr. W. W. Finley.

ELECTIONS AND APPO IN MENTS.

Alberene.—The officers of this company whose line is now under construction (April 15, p. 284), are as follows: President, C. D. Langhorne, Greenwood, Va.; Secretary and Engineer, R. E. Shaw, Alberene, Va.; Treasurer, H. L. Lane, Esmont, Va.

Bath & Hammondsport.—H. S. Stebbins has resigned as Manager, with office at Hammondsport, N. Y., and has been succeeded by President Charles W. Drake. Charles J. Drake has been appointed Acting Superintendent at Hammondsport, in adition to his present duties as Auditor.

Chattanooga Southern.—E. H. Harding has been appointed Master Mechanic, with office at Chattanooga, Tenn., succeeding J. H. McGill, resigned. The appointment is effective at once.

Chicago & Northwestern.—Frank Slater has been appointed Master Mechanic at Escanaba, Mich., succeeding John W. Clark, resigned.

Chicago, Burlington & Quincy.—Edward O. Brandt, Assistant Auditor of the Burlington & Missouri lines, with headquarters at Omaha, Neb., has resigned to accept the post of General Traveling Auditor for the Anheuser-Busch Brewing Association, of St. Louis, Mo.

Chicago Great Western.—Raymond du Puy, the new Superintendent, has re-established the Division Superintendencies on that road which were abandoned last August. (Aug. 6, 1897, p. 563.) The road is now divided into three divisions, as follows: From Chicago, Ill., to Oelwein, Ia., to be known as the Eastern Division, with headquarters of the Superintendent at Dubuque, Ia.; Oelwein to Minneapolis, Minn., to be known as the Northwest Division, with J. A. Kelly as Superintendent, with headquarters at St. Paul, Minn: Oelwein to Kansas City, Mo, to be known as the Southwest Division. J. Burlingett, Superintendent of Transportation at Oelwein, has been transferred to Des Moines, Ia., as Superintendent of the Southwest Division. No appointmedt has been made for the Superintendency of the Eastern Division.

Chihuahua & Pacific.—The officers of this company, whose line is now under construction, are: President, A. H. Pagett, 80 Broadway, New York; Vice-President and Engineer, E. C. Creel, Chihuahua, Mexico.

Cleveland, Cincinnati, Chicago & St. Louis.—The statement that George Tozzer, Assistant Purchasing Agent, had been appointed Purchasing Agent, succeeding the late A. M. Stimson, was premature. Mr. Tozzer has not been officially notified of the appointment.

Detroit & Lima Northern.—J. R. Hawkins, heretofore Superintendent of the Wabash, Chester & Western, with office at Chester, Ill., has been appointed Superintendent of the D. & L. N., with headquarters at Detroit, Mich., succeeding George R. Haskell, resigned. Appointment effective May 1.

Elkhart & Western.—Darwin F. Coe, Traffic Manager, with office at Elkhart, Ind., has resigned. Mr. Coe had been Traffic Manager since August, 1895, before which he was in charge of the Claims Department of the Chicago & Erie, at Chicago, Ill. He will hereafter be connected with the Holland & Chicago Line, at Chicago.

El Paso Southern.—At the annual meeting of this company, which was incorporated in Texas, March, 1897 (Mar. 12, 1897, p. 195), held at El Paso, Tex., April 16, the following Board of Directors was elected: J. P. Ramsey, E. W. Mead, J. H. McKinnell, J. T. Logan, A. F. Higgins, Solon Humphries and S. B. Agnew.

Grand Trunk.—Charles A. Sheedy has been appointed Master of Bridges and Buildings of the Middle Division, succeeding W. Chapman, resigned. Mr. Sheedy was formerly connected with the Illinois Bridge Co., of Chicago, Ill.

Hickory Valley.—N. P. Wheeler of Endeavor, Pa., is President and W. E. Wheeler of Portville is Vice-President. G. W. Warden is General Superintendent and Traffic Manager, with office at Endeavor, Pa.

Holland & Chicago Line.—Darwin F. Coe, heretofore Traffic Manager of the Elkhart & Western, at Elkhart, Ind., has been appointed General Freight and Passenger Agent of the H. & C. Line, operating steamers between Chicago and Holland, Mich.

Interoceanic of Mexico.—Sheldon T. Bent, Superintendent, with office at the City of Mexico, has resigned. W. T. Ingram has been appointed Superintendent of Transportation, in addition to his duties as Chief Engineer, with headquarters at Mexico City. S. G. Ramsay has been appointed Assistant Superintendent of Transportation.

Lake Erie & Detroit River.—Owen McKay has been appointed Engineer, with office at Windsor, Ont., succeeding the late Joseph de Gurse. (April 1, p. 244.)

Lehigh Valley.—H. S. Montgomery has been appointed General Storekeeper at South Bethlehem, Pa., succeeding Charles Phillip Coleman, resigned. (April 22, p. 297.)

Nashville, Chattanooga & St. Louis.—The division offices at Memphis, Tenn., will be abolished May 1, and the jurisdiction of the officials at Nashville will be extended over that division. Division Freight Agent George W. McFadden has been transferred to Chicago and assigned to other duties, and General Freight Agent W. H. Knox, has been transferred to St. Louis and assigned to other duties.

North Shore Dispatch.—O. R. Johnson, at one time Vice-Consul-General of the United States at London, Eng., has been appointed Agent of the North Shore Dispatch at Indianapolis, Ind.

Oregon Short Line.—At the annual meeting recently held in Salt Lake City, Utah, James Loeb, Oliver W. Mink and Winslow S. Pierce were elected Directors, succeeding E. Rollins Morse, Edward F. Whitney, of Boston, Mass., and Charles H. Coster, of Salt Lake City.

Philadelphia & Reading.—H. B. McKean was elected a Director at the annual meeting, held in Philadelphia April 20, succeeding his father, the late Thomas McKean. W. H. McCormick has been appointed District Passenger Agent, with headquarters in Philadelphia.

Santa Fe Pacific.—The general offices, except that of Superintendent of Machinery, have been moved from Albuquerque, N. M., to Los Angeles Cal. Karl A. Snyder, heretofore Assistant Attorney at Albuquerque, has resigned. T. F. Underwood of Emporia Kas., heretofore Foreman of the Mechanical Department in that city, has been promoted to the position of Division Master Mechanic, with headquarters at Williams, Ariz.

Snake River Valley.—The officers of this company, referred to in the Construction Column, are: President, Henry Failing; Secretary, W. W. Cotton; Chief Engineer, W. H. Kennedy, all of Portland, Ore. Mr. Cotton and Mr. Failing hold similar positions with the Oregon Railroad & Navigation Co.

Southern.—W. R. Beauprie, Superintendent of the Macon Division, has resigned, resignation to take effect May 1. He has been succeeded by A. Gordon Jones, of Selma, Ga.

Sumter & Wateree.—The officers of this new company (referred to in the Construction Column April 15, p. 285) are as follows: President, J. D. Blanding; Vice-President, Richard I. Manning; Treasurer, H. Ryttenberg; Attorney, R. D. Lee; Secretary, Attamont Moses. The general office is at Savannah, Ga.

Wabash, Chester & Western.—J. R. Hawkins has resigned as Superintendent, with office at Chester, Ill.,, the resignation effective May 1.

White River, Lonoke & Western.—J. N. Wooley, of Wooley, Ark., was recently elected General Manager, and Dan Daniel, heretofore Secretary, was elected Vice-President. J. W. Blackwood was elected Secretary, succeeding Mr. Daniel. The general office is at Lonoke, Ark.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

ABERDEEN & ASHEBORO.—Grading was begun last week on the extension of the Troy Branch south 14 miles to Mt. Gilead, N. C. The present road extends from Aberdeen to Asheboro, 57 miles with a branch from Filo west to Troy, 7.5 miles. J. R. Page of Aberdeen, N. C., is Superintendent. (March 25, p. 187.)

ATCHISON, TOPEKA & SANTA FE.—The Gulf, Colorado & Santa Fe line will build about 5 miles of track at Galveston, Tex., for which rails have been secured.

BOSTON & MAINE.—Preliminary surveys have been made for changing the grades for about 2 miles between Plaistow, Mass., and Newton Junction, and work is said to be in progress. The city of Augusta, Me., has given the company permission to build a connecting link within the city.

CANADIAN ROADS.—The House of Commons has granted a charter to the Lake Bennett & Klondike Railway & Tramway Co. to build a line from the north end of Marsh Lake, in the Northwest Territories, northeast about 35 miles to a point on the Hootalinqua River, with permission to operate a line on either side of Miles Canyon and the White Horse Rapids. This route is similar to that proposed by the Miles Canyon & Lewis River Tramway Co., whose incorporation was noted last week.

COAHUILA & ZACATECAS.—This line was completed March 31, and opened for traffic immediately afterward. (April 8, p. 265.) It runs from Saltillo, State of Coahuila, Mex., southwest 126 km. (78 miles) to Concepcion del Oro and parallels the Mexican National for 40 km. (25 miles). At Concepcion del Oro are situated extensive mining properties of gold, silver, lead and copper belonging to the Mazapil Copper Co., Ltd., of Manchester, Eng. William Purcell o Saltillo, Mex., is President of the railroad company and Managing Director of the mining company. All necessary rolling stock for the present has been bought, and is in service.

COLUMBUS, HOCKING VALLEY & TOLEDO.—The Williams Bill has become a law in Ohio granting to this company extension until Oct. 1, 1900, for completing the road. It is stated that work is to begin at once. The proposed line is from Columbus, O., to Athens, 70 miles. (April 1, p. 247.)

ERIE & CENTRAL NEW YORK.—The entire line from Cortlandt, N. Y., south 19 miles to Cincinnatus, has been completed, and trains begin running this week. W. D. Tisdale, of Cortlandt, is President. (Feb. 25, p. 148.)

HIDALGO & NORTHEASTERN.—A London syndicate has bought this road and has deposited the purchase price with Glyn, Mills, Currie & Co. of London, agent of the National Bank of Mexico. A representative of the syndicate left London April 16 to make a thorough inspection of the property and to arrange the final details of the purchase. Important changes are contemplated under the new management. The line extends from Mexico City to Sototlan, and from Irolo to Pachuca. It is proposed to extend it northeast to Tuxpan on the Gulf of Mexico, where harbor improvements to cost $2,000,000 are said to be planned.

KENNEBEC & FRANKLIN.—At a special election at Augusta, Me., the city voted to raise $10,000 for land damages for this new line from Augusta, northwest through Manchester, Winthrop and Reedfield to Mt. Vernon, about 45 miles. P. O. Vickery, of Augusta, Me., is President, and Parker Spofford, of Bucksport, Me., Chief Engineer. (Oct. 22, 1897, p. 755.)

KINDERHOOOK & HUDSON.—An extension has been decided upon from Niverville, N. Y., north about 20 miles, through North Chatham and Nassau to Troy. The road now runs from Hudson, N. Y., north 16 23 miles to Niverville. It was sold under foreclosure in 1896. (Feb. 18, p. 132.)

MEMPHIS, NEW ORLEANS & TEXAS.—This company has been organized to build a line from Memphis, Tenn., along the west bank of the Mississippi. The organization is not yet completed, but surveys are in progress. E. L. Phillips, Manager of the Delta Co-operative Co., Milwaukee, Wis., is among those interested. (Official.)

MISSISSIPPI VALLEY COAL CO.—Preliminary surveys are being run for this proposed line from Winfield, Ala., on the Kansas City, Memphis & Birmingham line of the Kansas City. Ft. Scott & Memphis, to run southwest about 50 miles to West Point, Miss., on the Aberdeen Branch of the Illinois Central. It is reported that work will begin in about 60 days.

NORTHERN PACIFIC.—Premier Greenway has announced in the Manitoba Legislature that the Dominion Government would assist the N. P. for an extension of 50 miles from Belmont, Man., west to Hartney. The grant is to be $1,750 per mile, with $20,000 additional for a bridge.

NOVA SCOTIA MIDLAND. — The Colchester County, N. S., Municipal Council has voted to continue its offer of the bonus of $6,000 made in April 1896, and to offer an additional $2,000 if the company will extend its line from Truro through Stewiacke to Eastville. The road is projected to run from Windsor, N. S., east through Scotch Village, Mosherville, Stanley and Kennetcook to Truro, about 50 miles.

OHIO RIVER & LAKE ERIE.—Surveys are reported in progress for the proposed extension from Bergholtz, O., to Jewett. This company is successor to the Lake Erie, Alliance & Southern. (Nov. 12, 1897, p. 806.)

PENNSYLVANIA COMPANY.—Work is in progress on the single-track tunnel at Glen Station, Pa. This tunnel is about 350 ft. long, with perhaps 20 ft. of cover. It is proposed to substitute for this an open cut for double-track, which double-track is to extend from Carnegie to Woodville, about two miles. (Official.)

PITTSBURGH & LAKE ERIE.—Grading is about half completed on the Speers Run Branch from Belle Vernon, on the Monongahela Division, about 2 miles up Speer's Run, to some coal mines. (March 18, p. 208.) The company will lay track and build bridges. Grady, Coda & Co. of Pittsburgh, have the contract for grading, masonry building and timber trestle work. The Schultz Bridge & Iron Co. of Pittsburgh furnish the iron work. There will be about five steel bridges and one temporary wooden trestle. (Official.)

PLANT SYSTEM.—Considerable work is being done in the yard at Jacksonville, Fla., in rearranging track and building warehouses. (Official.)

QUEEN & CRESCENT.—The report is officially denied that the Belt Railway of Chattanooga is to be extended. (Apr. 15, p. 285.)

RALEIGH & CAPE FEAR.—Grading has been completed for 5 miles from Raleigh, N. C., on the proposed line from Raleigh south in the direction of Lillington, about 35 miles, and good progress is being made in building. (Mar. 25, p. 225.) John A. Mills of Raleigh, N. C., is President. (Official.)

ST. LOUIS SOUTHWESTERN.—The Grays Point Terminal extension from Delta, Mo., east 16 miles to Grays Point on the Mississippi River, 5 miles below Cape Girardeau, is reported to be completed. It is stated that by June 1 a connection will be made by transfer boat with the Illinois extension at Grays Point, Ill. (Nov. 5, 1897, p. 791.)

SAN FRANCISCO & SAN JOAQUIN VALLEY.—Erickson Bros. and Buckman & Kelso, of San Francisco, have received contracts for building a portion of the extension near the big tunnel west from Stockton, Cal., to San Francisco. (April 22, p. 30.)

SNAKE RIVER VALLEY.—Survey has been made, but no other work done on this newly incorporated line to run from Amatilla, Ore., to Wallula, Wash., and thence along the Snake River Valley to Huntington, Ore. (Official.) The officers are given in another column. (March 25, p. 225.)

SOUTHERN.—Official statement is received that grading is in progress on 4 miles of the extension from near Leeds, Ala., to the ore mines of the Sloss Iron & Steel Co., but no work has yet been completed. (Feb. 25, p. 149.)

SOUTHERN PACIFIC.—Grant Bros., according to report, have established a camp at Chino, Cal., and have begun grading for an extension from Chino northwest about 5 miles to Pomona.

TOLEDO & OTTAWA BEACH.—The Ferguson Contracting Co. of New York has the contract for building this road from Toledo, O., north toward the Michigan line. The company was incorporated in Ohio with a capital stock of $100,000. Joseph King Duffy of Toledo is Vice-President. It is reported that the Wheeling & Lake Erie Terminals at Toledo are to be used by the new company. Work has begun near Toledo. (Feb. 4, p. 89.)

UNION PACIFIC.—The Union Pacific Land Company has been incorporated in Utah with a capital stock of $100,000, to develop lands owned by the U. P. R. R. The headquarters are to be at Salt Lake City. Horace G. Burt of Omaha, Neb., is President, and Lawrence Greer of New York City, Secretary.

WELLINGTON & POWELLSVILLE.—Rails have been laid from Windsor, N. C., to Powellsville, 16 miles, on this line from Windsor north to Ahoskie, and this part of the road is being operated. (March 11, p. 189.) The grading from Powellsville to Ahoskie is being pushed as rapidly as possible, and the company hopes to have the same completed within the next two months. One trestle being built through a wet swamp has given considerable trouble. J. W. Branning, of Edenton, N. C., is President. (Official.)

Electric Railroad Construction.

AUSTIN, TEX.—The Austin Dam & Suburban Railway Co. will build extensions. A. W. Leitnaker, Genl. Mgr.

DES MOINES, IA.—The Des Moines City Railway Co. will build an extension to Valley Junction, six miles.

KNOXVILLE, TENN.—The Knoxville Traction Co. was recently organized by the consolidation of the Knoxville, West End and Citizens' street railroad companies. The capital stock is $750,000. The Knoxville Traction Co. has issued, under date of April 1, $850,000 in bonds, first mortgage 5 per cent., 40-year gold; interest payable in October and April. Improvements will be made in the power plants and equipment; the roads consolidated will connect at various points, and extensions of track are contemplated. Mr. Frank S. Hambleton, Baltimore, Md., is president. This company also owns the entire capital stock of the Knoxville and the Mutual electric lighting and power companies, consolidated under the name of the Knoxville Electric Light & Power Co.

LINCOLN, N. J.—The Lincoln Trolley Co. was recently organized with a capital of $25,000, and will soon file a certificate of incorporation. Silas D. Drake is interested.

LONG ISLAND CITY, N. Y.—The New York & North Shore Railroad Co. has applied to the Railroad Commissioners for authority to extend its tracks to Jamaica, Whitestone, Flushing and other villages in Queens County.

LYKENS, PA.—The work of grading is now under way on the Lykens & Williamstown Valley Street Railway. (Dec. 24, p. 919.)

McKEESPORT, PA.—The Highland Grove Traction Co. is reported incorporated, with a capital of $12,000, to build a road 2 miles long. Among the directors are A. R. May and T. H. Bowman, McKeesport.

NEWARK, N. J.—The Board of Street and Water Commissioners granted the right to lay tracks in the southeastern section of the city to the Newark & South Orange Railway.

The Consolidated Traction Co. will extend its tracks on Clinton Ave.

PITTSBURGH, PA.—The Carnegie & Washington Street Railway Co. was recently incorporated with a capital of $18,000, to build a line 2¼ miles long through the principal streets of Carnegie, to connect with the Pittsburgh, Crafton & Mansfield Street Railway Co. President, A. S. Maxwell, Allegheny; directors, H. E. Barlow, A. M. O'Brien, G. C. Pugh, R. H. McLarn, Pittsburgh.

The Monongahela Street Railway Co. was incorporated, with a capital of $30,000, to build an electric railroad 5 miles long. The incorporators are L. G. Woods, F. M. Ross, Pittsburgh, and W. S. Mitchell, of Allegheny.

READING, PA.—The Mt. Penn Gravity Railroad has commenced running some of its cars by electricity. A short extension will be built. (March 4, p. 172.)

SAGINAW, MICH.—Reports state that the Saginaw Suburban Railway Co. has placed the contract for building the road from Saginaw to Flint, 35 miles, with Thick & Frink of Detroit. (March 11, p. 189.)

SCHUYLKILL HAVEN, PA.—The Town Council of Orwigsburg granted right of way to the Schuylkill Haven & Orwigsburg Electric Railway Co. The road must be completed within eight months, and it is stated the work of building has commenced. (March 25, p. 225.)

SYRACUSE, N. Y.—The Syracuse, Skaneateles & Moravia Railroad Company was incorporated recently, with a capital stock of $1,000,000, to build an electric road 40 miles long through the counties of Cayuga and Onondaga. The directors are Wing T. Parker, President; Thomas W. Downing, Treasurer; John Andrews and Joseph Parker of Moravia, and Henry J. Hibbard of Skaneateles. (Nov. 12, '97, p. 807; March 18, '98, p. 209.)

TACOMA, WASH.—The Tacoma & Columbia River Railway Co. is reported organized to build an electric road in Tacoma.

TOLEDO, O.—The Toledo & Monroe Railway Co. expects to have its road built and cars running between Toledo and Monroe, 23 miles, by July 15. The power house is now under roof and the machinery is expected to be on the ground by May 1. The road will be laid with 70 lb. T rails, stone ballast. Ten closed cars, each equipped with four 50 H. P. motors, will be used. About 2,000 ft. of trestle work will be required over the ravine from Monroe to Monroe Beach. The stockholders are: P. N. Jacobsen, W. C. and W. M. Johnson of Detroit, Holt, Schober & Co., 701 Hall Building, Philadelphia, Pa.; J. W. Beck of Toledo has the contract for building the road. (Feb. 19, '97, p. 141; Jan. 28, '98, p. 71.)

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

February 28:		1898.	1897.	Inc. or Dec.
Baltimore & Ohio Southwestern.				
1 month	Gross	$527,729	$454,004	I. $73,725
1 "	Net	150,036	120,988	I. 29,048
8 months	Gross	4,522,376	4,098,522	I. 423,854
8 "	Net	1,400,555	1,259,450	I. 141,105
Central Pacific.				
1 month	Gross	$1,062,118	$804,251	I. $257,867
1 "	Net	393,664	224,569	I. 169,095
8 months	Gross	2,113,936	1,663,164	I. 450,772
8 "	Net	747,325	498,996	I. 248,329
Grand Trunk.				
1 month	Gross	$1,327,638	$1,229,138	I. $98,500
1 "	Net	274,734	207,785	I. 66,949
Lake Erie & Western.				
1 month	Gross	$272,042	$268,617	I. $3 425
1 "	Net	114.459	120,187	D. 5,728
2 months	Gross	547,769	521,278	I. 26,491
2 "	Net	229,333	224,631	I. 4,702
Missouri, Kansas & Texas.				
1 month	Gross	$846,478	.....	.....
1 "	Net	191,001	.....	.....
8 months	Gross	8,915,443	.....	.....
8 "	Net	3,195,553	.....	.....

March 31:		1898.	1897.	Inc. or Dec.
Atchison, Topeka & Santa Fe.				
1 month	Gross	$3,368,541	$2,863,302	I. $505,239
1 "	Net	960,456	623,812	I. 336,644
9 months	Gross	29,711,141	25,327,613	I. 4,383,528
9 "	Net	8,428,002	6,923,745	I. 1,504,257

Chicago Great Western.

1 month	Gross	$490,502	$428,539	I.	$61,963
1 "	Net	164,395	131,360	I.	33,035
9 months	Gross	1,275,323	1,139,105	I.	136,218
9 "	Net	362,726	318,277	I.	44,449

Cincinnati, New Orleans & Texas Pacific.

1 month	Gross	$339,094	$290,703	I.	$48,391
1 "	Net	112,353	96,564	I.	15,789
9 months	Gross	2,932,966	2,536,768	I.	376,198
9 "	Net	976,607	780,179	I.	196,428

Nashville, Chattanooga & St. Louis.

1 month	Gross	$460,314	$415,203	I.	$45,111
1 "	Net	132,947	132,078	I.	869
9 months	Gross	4,269,359	3,815,255	I.	454,104
9 "	Net	1,480,001	1,435,053	I.	44,948

Northern Central.

1 month	Gross	$515,510	$505,941	I.	$9,569
1 "	Net	110,696	127,684	D.	16,988
3 months	Gross	1,531,825	1,580,458	D.	48,633
3 "	Net	345,708	489,606	D.	143,898

Northern Pacific.

1 month	Gross	$1,847,346	$1,354,508	I.	$492,838
1 "	Net	884,795	501,823	I.	382,972

Pittsburgh, Cincinnati, Chicago & St. Louis.

1 month	Gross	$1,309,219	$1,136,233	I.	$172,986
1 "	Net	309,855	225,770	I.	184,085
3 months	Gross	3,837,761	3,289,926	I.	547,835
3 "	Net	982,891	665,722	I.	317,169

Reading Company.

Philadelphia & Reading.

1 month	Gross	$1,733,654	$1,548,482	I.	$185,172
1 "	Net	702,191	624,368	I.	77,823
9 months	Gross	16,834,405	15,770,048	I.	1,054,357
9 "	Net	7,567,293	7,043,229	I.	524,064

Coal & Iron Company.

1 month	Gross	$1,194,893	$1,256,099	D.	$61,206
1 "	Net	*20,445	*107,042	D.	86,597
9 months	Gross	17,966,599	16,821,789	I.	1,144,810
9 "	Net	714,932	356,616	I.	358,316

*Loss.

BROOKLYN & BRIGHTON BEACH.—The suit of the Central Trust Co. of New York to foreclose a mortgage of $500,000 on the B. & B. B. was tried in the Supreme Court at Brooklyn, N. Y., April 23, before Justice Johnson. Decision was reserved. This is a double-track road, extending from Atlantic avenue, Brooklyn, to Brighton Beach, 7.5 miles. Since July, 1897, the trains of the Kings County Elevated only have been run over the road. Receivers were appointed on Jan. 14. (Jan. 21, p. 51.)

Judge Maddox, in the Supreme Court at Long Island City last week, granted the application of the receivers for permission to issue receivers' certificates for $50,000 to make improvements and pay wages. (Feb. 11, p. 111.)

CHICAGO & SOUTHWESTERN.—The Court has ordered the sale of the right of way from Andersonville, Ind., to Munice on May 31, to satisfy the claim of A. J. Wayger, of Ohio, for grading. The road was in the hands of a receiver for several weeks near the close of the year, and proceedings were recently begun in the United States Court at Indianapolis for the appointment of another receiver. (Feb. 11, p. 111.)

CHICAGO & WEST MICHIGAN.—The Directors have voted to pay coupons due May 1 of Chicago & North Michigan 5 per cent. bonds, half in cash and the other half in 10-year coupon scrip of the same form and on the same basis as that heretofore issued. (Dec. 3, 1897, p. 861.)

CHICAGO JUNCTION.—Papers have been filed in Illinois completing the consolidation of the Chicago, Hammond & Western and the Chicago & Indiana State Line into the Chicago Junction. The capital stock is $2,200,000. The Chicago Junction began operation April 1. (April 8, p. 267.)

CHICAGO, ROCK ISLAND & PACIFIC.—Suit has been brought by this company in the United States Circuit Court at Chicago against the Hannibal & St. Joseph line of the A., T. & S. F. to obtain $1,615,625 alleged over-charges in tolls on the Kansas City bridge since 1880.

COLORADO MIDLAND.—Holders of over 80 of the $108,000 Aspen Short Line first mortgage 8 per cent. gold bonds, issued in 1889, have assented to the offer of the C. M. to exchange these for C. M. 4 per cent. bonds and 50 per cent. in preferred stock. The Aspen Short Line was consolidated with the C. M. Dec. 1, 1893.

COLUMBUS, SANDUSKY & HOCKING. — The United States Court at Columbus, O., has delivered to Receiver S. M. Felton, Receiver's certificates for $263,000, to be used for buying freight cars. (March 18, p. 209.)

EMMITSBURG.—This company, whose road was sold at public auction at Frederick, Md., Sept. 11, to a syndicate representing the bondholders, has been reorganized under the laws of Maryland, the capital stock being $50,000. The incorporators of the new company are: William G. Blair, Jesse H. Mussear, Vincent Sebold, James A. Elder, of Emmitsburg, Md., and William A. Himes, of New Oxford, Pa. The line extends from Rocky Ridge, Md., on the Western Maryland, north 6.7 miles to Emmitsburg. (Sept. 17, 1897, p. 659.)

KNOXVILLE & BRISTOL.—This company, successor to the Morristown & Cumberland Gap, sold, Feb. 19, to Adolph Segal, of Philadelphia, has filed a mortgage of $1,000,000 to the Security & Trust Co. of Camden, N. J., as Trustee. The loan covers the present line from Morristown, Tenn., to Corryton 40 miles, and also the proposed extensions southwest to Knoxville and northeast to Bristol, making when completed 120 miles. The authorized capital stock of the new company is $1,000,000. (Feb. 25, p. 150.)

MANHATTAN, ALMA & BURLINGAME.—This road was sold at auction for $200,000 at Topeka, Kan., April 19, to Adiel Sherwood, of St. Louis, the only bidder. He is understood to represent the A., T. & S. F., which has been operating the road since it was placed in the hands of a receiver, Jan. 19, 1895. The line extends from Manhattan, Kan., to Burlingame, 56.62 miles. (March 11, p. 190.)

PECOS VALLEY.—This road was sold at public auction at Eddy, N. M., April 19, for $500,000, to the Pecos Valley & Northeastern, the successor to the old company. The line runs from Pecos City, Tex., north to Roswell, N. M., 163.87 miles, and will be extended northeast 206 miles from Roswell to Amarilla, where connection will be made with the A., T. & S. F. (April 15, p. 286.)

RICHMOND, NICHOLASVILLE, IRVINE & BEATTYVILLE. — Adolph Segal, of Philadelphia, who bought this road at foreclosure sale in December, 1897, for $265,000, has failed to make the payments of the purchase price as agreed, one-half on Feb. 28 and the other on April 11. It is stated, however, that he proposes to raise money to pay off mechanics' liens in cash. These amount to $450,000, and after satisfying the $123,000 of receiver's certificates there would be left 35 cents on the dollar for holders of these liens. He proposes to secure holders of receivers' certificates by securities of the road, which shall be practically a first mortgage on the property. The line extends from Versailles, Ky., to Irvine, 60.7 miles, and the new company, the Louisville & Southeastern, was incorporated Dec. 23, 1897. (Jan. 21, p. 52.)

ST. LOUIS, KANSAS & SOUTHWESTERN.—Holders of $715,000 of the $890,000 outstanding bonds of this company have accepted the offer of the St. Louis & San Francisco to exchange for each $1,000 St. L., K. & S. W. bond 18 shares of the St. L. & S. F. common stock. The St. L., K. & S. W. was leased to the old St. L. & S. F. for 98 years from 1886. The new St. L. & S. F. Co. refused to assume the lease, but continued to operate the road for its owners until October, 1896. A receiver for the St. L., K. & S. W. was appointed Nov. 28, 1896, under whom the road is now operated. The line extends from Kansas City, Kan., to Anthony, 59.35 miles.

SUGAR RUN.—Official statement is received that this road has been abandoned and that the rails will be taken up this summer. The line extends from Allegheny Junction, Pa., to Allen's Camp, 8 miles, and was completed in 1894. It was built to accommodate lumber business, and is no longer needed.

UNION PACIFIC. — Holders of Atchison & Pike's Peak first mortgage 6 per cent. bonds and Central Branch U. P. funded coupon 7 per cent. bonds are notified that the bondholders' agreement of March 9, 1896, has become operative. The time for depositing these securities with the Union Trust Co. of New York under the terms of the agreement has been extended to May, after which no bonds will be received except on such terms as the committee may impose.

WABASH.—By the terms of the agreement with the Grand Trunk between Windsor and Buffalo (March 4, p. 172) the Wabash is to pay $275,000 a year for the first five years, to be increased at the end of each five years by $25,000 a year to a maximum of $350,000 per annum, which will continue until the end of the 21 years of the lease.

WASHBURN, BAYFIELD & IRON RIVER.—Suit has been begun by a number of tax payers of Bayfield County, Wisconsin, to restrain the delivery of stocks and bonds by the county to this company. Recently the Wisconsin Supreme Court decided that the company should have immediate possession of $100,000 in bonds voted by the people on the line two years ago, which have been earned by the completion of the first 20 miles. It is claimed by the plaintiffs that the company has not completed the road under contract, and that it is trying to defraud the county and other stockholders by selling stocks and bonds of the railroad company at much less than their value. An injunction and receiver are applied for. (Jan. 21, p. 51; April 1, p. 248.)

YANKTON, NORFOLK & SOUTHWESTERN.—Judge Munger of the Federal Court at Omaha, Neb., has signed a decree ordering a foreclosure sale on the property of this company within 20 days, unless liens are satisfied within that time. The sale is to take place at the Court House at Pierce, Neb., and is to satisfy mechanics' liens held by W. W. Graham, $9,982; Henry E. Owens and David Owens, $6,459, and John Naughton, $16,112. The upset price is fixed at $45,000. The road was projected to extend from Norfolk, Neb., north about 60 miles to Yankton, S. D., and of this about 20 miles through Osmond and Wausa is said to have been completed in 1893.

Electric Railroad News.

CINCINNATI, O.—The published report of the Cincinnati Consolidated Street Railway Company shows a gross income of $3,000,000 on 200 miles of road. From this the company pays the city 5 per cent., or $150,000 per year. It also pays a tax of $4 per lineal foot of cars operated, which amounts to $160,000 more, or a total of $310,000, in addition to real and personal city and county taxes. The street railroad lines in Cincinnati connect many suburban towns with the city, and a 20-mile ride, with transfer to one other line, is given for one five-cent fare. Some of the accommodations provided by the Cincinnati lines are: Cars two minutes apart at Fountain Square, the center of the city; vestibuled closed cars in winter, lighted and heated by electricity; open vestibuled cars in summer, with fenders; no one permitted to stand in the motorman's vestibule; every car provided with illuminated signs, so that at night they can be read half a square away; night cars run to all populous suburbs, 30 minutes apart; all tracks have been relaid within the last five years; the rails are 95 lbs. to the yard, and laid on concrete foundations with cast welded joints.

The Cincinnati Inclined Plane Railway was bought at the recent foreclosure sale by Charles H. Kilgour, of the Cincinnati Street Railway Co., for $278,000.

JOLIET, ILL.—At a meeting of the directors of the Joliet Railroad Co. the following officers were elected: Pres., Weston F. Milliken; Vice-Pres., George F. Duncan; Treas., George S. Cox; Secy. and Atty., Henry Woodman, all of Portland, Me.; Mgr., William McKinley, of Champaign, Ill.; Supt., C. C. Rush, of Joliet. (April 8, p. 266.)

LOUISVILLE, KY.—Mr. J. B. Speed has resigned the presidency of the Louisville Railway Co., and will be succeeded by T. J. Minary, the General Manager.

ROCHESTER, N. Y.—The Rochester Electric Railway Co. has leased the Rochester & Irondequoit Railroad Co. for 10 years.

TRAFFIC.

Traffic Notes.

The Missouri Pacific, the Texas & Pacific and the Southern Pacific are to put on a fast freight train between St. Louis and San Francisco.

A press dispatch from Buffalo says that the Western Elevating Association, controlling 18 grain elevators in Buffalo, will transfer grain this year at ⅝ of 1 cent a bushel, which rate includes 10 days' storage. This is a reduction of ¼ of a cent.

The drought in California has so diminished the grain crops that there is now a considerable movement of corn and oats to the Pacific Coast from Kansas and Nebraska. On one day last week 85 cars of corn were delivered to the Atchison road at Kansas City for points in California.

The Manhattan Elevated Railway, New York City, announces that during the summer season trains with a car for carrying bicycles will be run on the Ninth Avenue Line on every Sunday and holiday. Fourteen trains will run each way in the morning between 7 and 10; and 16 trains each way in the afternoon between 4 and 8.

It is reported from St. Louis that the movement of freight for export to Europe is considerably interfered with by the refusal of railroad agents to make rates beyond the seaboard. St. Louis grain men have advices from New Orleans and all the Gulf ports stating that exporters in those cities will make no attempt to send ships to Europe until after the war is over.

The railroads of the Southeastern Passenger Association have, it is reported, agreed to make a uniform charge of 2 cents a mile per capita for the transportation of troops. The roads of the Western Passenger Association have discussed the question of rates for troops, and, it is said, are likely to agree upon a rate of 1½ cents. The original proposition was to make the rate of 2 cents, but as state troops have been carried to their national encampments for several years at 1 cent a mile, it is pointed out that it might have an unpatriotic appearance if a higher rate should now be asked from the Federal Government.

The Board of Control of the Joint Traffic Association met in New York City on April 26, 30 companies being represented. A communication was received from the Quarter Master General of the United States Army asking that action be taken looking to the establishment of uniform rates for the transportation of troops and army supplies. Westbound freight rates were reported in good condition, and the subject of eastbound rates, though discussed at length, was referred to the Managers. The articles of organization were amended, so that a Chairman of Directors, or a Receiver, may be a representative in the Board of Control.

The new Canada Atlantic freight line was opened April 20 when the new steel steamer William R. Linn sailed from South Chicago for Parry Sound with a cargo of 214,500 bush. of corn. The time from Chicago to Parry Sound is 45 hours, the distance being 550 miles. Some description of the facilities of the Canada Atlantic line was given in the Railroad Gazette of March 4 and 25. It is now stated that of the 25,000 sq. ft. of docks at Parry Sound, the company has 15,000 ft. completed. Two large warehouses have been built, and one elevator with all modern fittings and of 1,000,000 bush. capacity is finished, and a second similar one is now being built. The elevator at Coteau Landing will be completed about May 10. The harbor at Parry Sound is 22 ft. deep. The railroad company has lately ordered 15 heavy locomotives, and has in service about 5,000 cars.

Chicago Traffic Matters.

Chicago, April 27, 1898.

The all-rail eastbound lines from Chicago are getting little business that can go by lake, in spite of the low rates prevailing. The refusal of the Joint Traffic managers to reduce the grain rate from 20 cents to 17½ cents cuts no figure whatever, as each line is making whatever rate it chooses in order to secure business. It is said that there is a general understanding that not more than 13 cents will be charged by any line, but it appears to be a general scramble for business in utter disregard of any agreement or association. Of last week's shipments, the Baltimore & Ohio road alone carried, according to the Board of Trade statement, 21.3 per cent. of the entire tonnage, while its allotted percentage is 12.5.

The St. Paul road has abandoned its traffic alliance with the Rock Island Company, by which it ran through trains via Omaha to Denver.

Western roads have failed to reach any agreement for a restoration of rates on packing house products, dressed beef and live stock. The cut of 5 cents put in by the Missouri Pacific from Kansas City to St. Louis has not been met by its competitors.

Passenger representatives of the Western roads are already claiming that they see indications of an immense passenger travel to Colorado resorts this summer, on account of the war, people planning to keep away from the sea shore.

The "Pioneer Limited," the new equipment of the St. Paul road, to run between Chicago and St. Paul, will go into service on May 10.

The Western roads have decided not to reduce the present charge of $2 per car on live stock delivered at the Union Stock Yards here.

Eastbound shipments, exclusive of live stock, from Chicago and Chicago junctions to points at and beyond the western termini of the Trunk Lines for the week ending April 21, amounted to 92,842 tons, as compared with 94,533 tons the preceding week. This statement includes 39,020 tons of grain, 7,008 tons of flour, and 14,522 tons of provisions. The following table shows the quantities and proportions carried by the respective roads:

Roads.	Week Ending April 21. Tons.	P. C.	Week Ending April 14. Tons.	P. C.
Baltimore & Ohio	20,757	22.4	13,236	14.0
C., C., C. & St. L.	4,307	4.6	4,124	4.4
Erie	9,443	10.2	13,488	14.3
Grand Trunk	7,934	8.5	8,371	8.9
L. S. & M. S.	9,831	10.6	14,487	15.3
Michigan Central	10,017	10.8	11,193	11.8
N. Y., C. & St. L.	4,765	5.1	5,141	5.4
P., C., C. & St. L.	6,479	7.0	5,648	6.0
Pitts., Ft. Wayne & Chi.	11,779	12.7	11,819	12.5
Wabash	7,530	8.1	7,026	7.4
Totals	92,842	100.0	94,533	100.0

Lake shipments last week amounted to 160,209 tons.